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(54) Composition for treating meat.

(57) A composition is provided of inorganic polyphosphates which will form a clear, stable solution suitable for injection into meat products. The composition comprises sodium tripolyphosphate and a long-chain glassy phosphate in sufficient quantities to provide 92 to 85 parts by weight sodium tripolyphosphate and 8 to 15 parts by weight of long-chain glassy phosphate, said long-chain glassy phosphate having a degree of polymerization of about 20 to 30, an average mole ratio of $(Na_2O + H_2O)/P_2O_5$ below about 1.067, and preferably possessing terminal groups on the polyphosphate chain having no less than about 75% OH with the remainder being ONa.

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COMPOSITION FOR TREATING MEAT

The present invention is a composition for treating meat by injection.

Inorganic phosphates have been recognized as useful compositions to treat meat products.

U.S. Patent No. 3,104,978 to Elder discloses the use of hydrated crystalline and glassy phosphates in meat curing compositions wherein the phosphate has a Na_2O/P_2O_5 ratio of between about 1.8/1 and 1.95/1. U.S. Patent No. 3,104,170 to Mahon teaches fresh or precooked poultry may be better preserved in the cooked state by soaking the uncooked poultry in sodium or potassium polyphosphates having a $H_2O:P_2O_5$ ratio ranging from 0.9-2.0:1. The preferred polyphosphate is tripolyphosphate, but pyrophosphates and hexametaphosphates are also useful. In U.S. Patent No. 3,689,283 a mixture of sodium tripolyphosphate and 10% sodium hexametaphosphate is preferred. U.S. Patent No. 3,462,278 to Mahon teaches cooking old poultry (more than 10 months old) in a solution of the same alkali metal polyphosphates.

U.S. Patent No. 3,573,062 to Paynter et al. teaches that coarsely chopped muscle meat can be bonded with polyphosphates to fabricate cuts of meat.

The U.S. government regulations permit the use of such phosphates for treating meats, but 9 C.F.R. 318.7 requires that only clear phosphate solutions may be injected into meat products.

In accordance with the present invention pickling solutions prepared from polyphosphate solutions previously employed do not remain clear on standing but become turbid or even form precipitates, particularly when maintained at elevated temperatures. Such pickling solutions cannot be injected into meat products and instead must be discarded. This is not only economically wasteful, but also is undesirable on environmental grounds.

The present invention which overcomes the deficiencies of the prior art is a composition suitable for preparing a clear, aqueous polyphosphate solution comprising 8 to 15 parts by weight long-chain glassy phosphate, said long-chain glassy phosphate having a degree of polymerization of about 20 to 30, an average mole ratio of $(Na_2O + H_2O)/P_2O_5$ between about 1.067 and 1.1, and preferably possessing terminal groups on the polyphosphate chain having no less than about 75% OH with the remainder being ONa, and 92 to 85 parts by weight sodium tripolyphosphate, said composition forming a stable, clear solution when dissolved into an aqueous solution suitable for injecting into meat products.

A long-chain glassy phosphate suitable for use in this invention is marketed under the tradename Glass H phosphate by FMC Corporation and its method for manufacture is taught in U.S. Patent No. 3,130,002 to Fuchs.

The preferred composition of this invention comprises about 10% long-chain glassy phosphate and about 90% sodium tripolyphosphate. The scope of this invention is intended to include the composition admixed with other meat pickling additives, aqueous solutions prepared from the compositions containing 8 to 15 parts by weight of the long-chain glassy phosphate and 92 to 85 parts by weight sodium tripolyphosphate (STPP). Clear aqueous pickling solutions may be prepared containing from about 16% by weight polyphosphates to substantially 0%. The effective practical concentration range for the composition of this invention is about 1% to 16% by weight, preferably about 2% to 16%. Clearly the effect of sodium or hydrogen terminal groups, OH or ONa, will only have an effect on the pH of the solution. The composition containing no less than 75% OH terminal groups is preferred because it is available commercially as Glass H brand phosphate.

The invention consists of a physical blend of STPP and long-chain glassy phosphate. The components can be blended in a number of methods well known to those in the field, for instance PK Blender, Ribbon Blender, or even by the mixture of both components in a screw conveyor, as well as any other convenient mixing means.

In the meat industry, mixtures of phosphate, salt, sugar, sodium erythorbate, sodium nitrite and spices are prepared in water to form curing pickles. These are added to meat by injection, soaking or tumbling the meat with the solution until the solution is absorbed by the meat. At certain levels of phosphate and salt, the solution is not stable, causing turbidity or a precipitate in the solution. Typically the phosphate used in such pickles is sodium tripolyphosphate, which is used to increase the water binding capacity of the meat, as well as improve the flavor, odor and texture of the meat.

The cause or nature of the turbidity or precipitation which forms in these pickles is not known. However, the following examples illustrate the invention to obtain stable solution suitable for injection into meat products.

EXAMPLE 1

Poultry Pickle

A typical poultry pickle was prepared using the following recipe: 4.41%-8% phosphate (total), 16.5% NaCl, 5.51% sucrose, 73.57%-69.98% water. For each increasing percentage of phosphate used (4.41, 5, 7, 8), the phosphate was dissolved in the corresponding amount of water in a beaker with a magnetic stir bar. To this the 16.52% salt was added and dissolved. Sucrose at the 5.51% level was then added and stirred to complete dissolution. The solution was observed for turbidity and/or particles settling out. Data was obtained on the solution: during preparation (each step of the process), at the end of the first day (the day in which the solution was made), and at the start of the second day. All percentages are by weight.

The phosphates employed and the results are presented as Table I. STPP remained soluble up to the 4.41% phosphate level with 16.5% salt, while at higher concentrations, it precipitated. STPP/Glass H blends showed more stability than other blends at all concentrations. At the 4.41% level, STPP/Glass H phosphate blends remained clear throughout the first day and in some cases through the second. Meanwhile, STPP/Sodaphos phosphate blends demonstrated less stability than any of the other blends and became turbid approximately two hours after preparation. This general tendency was also seen at the 5% level. At the higher phosphate concentrations, the superiority of the 90/10 Glass H blends was illustrated by their clarity through the first day, while the other blends became turbid or developed a precipitate.

Sodaphos phosphate is the trademark of FMC Corporation's alkali metal glassy phosphate having an average chain length of about 6.

EXAMPLE 2

A study was made comparing STPP alone and the preferred 90/10 blend of STPP and long-chain glassy phosphate (Glass H brand) in the presence of salt. The results are presented as Table II. The table shows the blend is more soluble than the STPP alone (16% phosphate) at all concentrations, particularly in the presence of salt.

It was found that the compositions were soluble in hard water without turbidity and that solutions could be maintained at elevated temperatures of 30° C without turbidity.

TABLE I

POULTRY PICKLE SOLUTIONS WITH VARIOUS PHOSPHATE CONCENTRATIONS

with: 16.52% salt
5.51% sugar
Variable Phosphate Levels

	4.41% Phos.			5.0% Phos.			7.0% Phos.			8.0% Phos.	
	During Prep	1st Day	2nd Day	During Prep	1st Day	2nd Day	During Prep	1st Day	2nd Day	During Prep	1st Day
Phase II STPP	c	p	p	t-	t	p	s	-	-	s	-
Nutrifos B-90(TM Monsanto)	c	c	p	c	c	p-	c	p-	p	c	p-
Curafos 11-2(TM Stauffer)	c	c	p	c	c	p	c	t	p	c	t
FMC Blend 90/10 STPP/ Glass H*	c	c-	c	c	c	c	c	c	t-	c	c
Lab 90/10 STPP/SHMP Blend	c	c	p-	c	c	p	c	t	p-	t	p-
95/5 STPP/Sodaphos*	c	t	p	c	t	p	t	p	p	t+	p

TABLE 1 (cont'd.)

POULTRY PICKLE SOLUTIONS WITH VARIOUS PHOSPHATE CONCENTRATIONS

	4.41% Phos.			5.0% Phos.			7.0% Phos.			8.0% Phos.	
	During Prep	1st Day	2nd Day	During Prep	1st Day	2nd Day	During Prep	1st Day	2nd Day	During Prep	1st Day
90/10 STPP/Sodaphos*	c	t	p	c	t	p	c	t	p	c	p
85/15 STPP/Sodaphos*	c	t-	p	c	c	p	c	t+	p-	c	t-
95/5 STPP/Glass H*	c	c	p-	c	p-	p-	c	t	p-	c	t
90/10 STPP/Glass H*	c	c	c	c	c	p-	c	p-	p-	c	c
85/15 STPP/Glass H*	c	c	p-	c	c	c	c	c	p	c	c
Kena FP-28 (TM Stauffer)	c	c	p-	c	c	p-	t	p	p	t	p

Key:

c= clear

p=precipitate
p+=large amount of precipitate
p-=small amount of precipitate

t=turbid
t+=very turbid
t-=slightly turbid

* Glass H is a trademark of FMC Corporation long chain glassy phosphate having a chain length of 20-30.
Sodaphos is a trademark of FMC Corporation's glassy phosphate having an average chain length of 6.

TABLE II

SOLUBILITY OF STPP AND A STPP-LONG-CHAIN GLASSY PHOSPHATE BLEND WITH NaCl		
STPP Blend Used: 90/10 STPP/Glass H Glassy Phosphate		
Total % Phosphate	% Salt in STPP Solution	% Salt in Blend Solution
15.6	-	0.0.
14.1	0.0	-
14.0	-	6.0
12.0	4.0	13.0
10.0	7.5	16.0
8.5	9.5	-
7.0	10.0	20.5
6.0	12.0	-
5.0	13.0	24.0
4.4	15.5	24.5
2.5	18.0	25.5

Claims

1. Composition suitable for preparing a clear, aqueous polyphosphate solution characterized by 8 to 15 parts by weight long-chain glassy phosphate, said long-chain glassy phosphate having a degree of polymerization of about 20 to 30, an average mole ratio of $(Na_2O + H_2O)/P_2O_5$ between 1.067 and 1.1, and 92 to 85 parts by weight sodium tripolyphosphate, said composition forming a stable, clear solution when dissolved into an aqueous solution suitable for injecting into meat products.

2. The composition of claim 1 characterized by 10 parts by weight long-chain glassy phosphate and 90 parts by weight sodium tripolyphosphate.

3. A clear, aqueous solution comprising 2% to 16% by weight polyphosphates, said polyphosphates characterized by 8 to 15 parts by weight long-chain glassy phosphate, said long-chain glassy phosphate having a degree of polymerization of 20 to 30, an average mole ratio of $(Na_2O + H_2O)/P_2O_5$ between 1.067 and 1.1, and 92 to 85 parts by weight sodium tripolyphosphate.

4. The clear, aqueous solution of claim 3 characterized in that the phosphate comprises 10 parts by weight long-chain glassy phosphate and 90 parts by weight sodium tripolyphosphate.

5. A polyphosphate composition characterized by polyphosphates, sodium tripolyphosphate and a long-chain glassy phosphate, in sufficient quantity to provide from 92 to 85 parts by weight sodium tripolyphosphate and the balance of 8 to 15 parts by weight of long-chain glassy phosphate for each 100 parts by weight polyphosphate, said long-chain glassy phosphate having a degree of polymerization of about 20 to 30, an average mole ratio of $(Na_2O + H_2O)/P_2O_5$ between 1.067 and 1.1.

6. The composition of claim 5 characterized by sufficient added aqueous liquid to provide a clear, aqueous solution containing 1% to 16% by weight polyphosphate.

7. The composition of claim 5 characterized in that the polyphosphates are present in the ratio of 90 parts by weight sodium tripolyphosphate and 10 parts by weight long-chain glassy phosphate.

8. The composition of claim 6 characterized in that the polyphosphates are present in the ratio of 90 parts by weight sodium tripolyphosphate and 10 parts by weight long-chain glassy phosphate.

9. The composition of claims 6 or 8 characterized in that the clear solution also comprises up to 25% by weight salt.

10. The composition of claim 5 characterized in that the terminal groups of the polyphosphates have no less than about 75% OH groups with the remainder being ONa.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 61 0031

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-4 781 934 (L.A. SHIMP et al.) * abstract; claims 1-15 *	1	A 23 B 4/02 A 23 B 4/08
A	PATENT ABSTRACTS OF JAPAN vol. 6, no. 31 (C-92)(909), 24 February 1982; & JP-A-5615448 (UENO SEIYAKU OUYOU KENKYUSHO K.K.) 24-11.1981	1	
A	DE-A-1 492 692 (STAUFFER CHEMICAL CO.) * claims 1-3 *	1	
D,A	US-A-3 130 002 (R.J. FUCHS) * claims 1-3 *	1	
D,A	US-A-3 104 978 (E.V. ELDER) * the whole document *		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A 23 B 4/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	16-08-1990	SCHULTZE D

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)

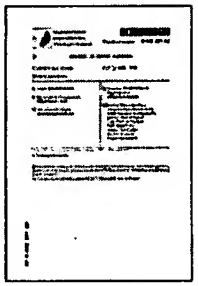
The Delphion Integrated View

Title: **EP0442361A2: Treatment of meats**[German][French]

Derwent Title: Marinade for tenderising raw meat - comprising denatured lactoserum protein [Derwent Record]

Country: **EP** European Patent Office (EPO)

Kind: **A2** Publ. of Application without search report [i] (See also: EP0442361A3, EP0442361B1)



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Priority Number: 1990-02-09 **EP1990000102562**

Abstract: In order to improve the texture of meats to be cooked, particularly those intended for prepared cooked dishes, a marinade, containing denatured milk serum (whey) proteins and, if need be, non-gelled starch, is incorporated into the raw meat. The denatured serum proteins represent 0.5 to 2.5% by weight of the raw meat.

Legal Status:

Designated Country: CH DE DK ES FR GB IT LI SE

Family: Show 25 known family members

Description [From equivalent EP0442361A3]

Expand description

La présente invention concerne un procédé d'amélioration des viandes à cuire, notamment celles destinées aux plats cuisinés.

+ **Exemples 1-6**
+ **Exemple 7**
+ **Exemples comparatifs A-D**
+ **Exemples 8-12**
+ **Exemples comparatifs E-J**
+ **Exemples 13-14**
+ **Exemple comparatifs K-L**
+ **Exemples 15-16**

Other Abstract Info: None

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(54) Traitement des viandes.

(57) Pour améliorer la texture des viandes à cuire, notamment celles destinées aux plats préparés cuisinés, on incorpore à la viande crue une marinade contenant des protéines de lactosérum dénaturées et le cas échéant de l'amidon non-gélifié.
Les protéines sériques dénaturées représentent 0,5 à 2,5% en poids de la viande crue.

EP 0 442 361 A2

TRAITEMENT DES VIANDES

La présente invention concerne un procédé d'amélioration des viandes à cuire, notamment celles destinées aux plats cuisinés.

Certains morceaux cuits de bonne qualité, c'est-à-dire maigres et pauvres en collagène peuvent présenter des défauts de texture lorsqu'ils sont régénérés dans un four ou dans l'eau bouillante après avoir été entreposés par exemple à l'état congelé, ceci même si la cuisson a été à courte et à basse température.

D'autres morceaux de qualité moindre, généralement plus gras et contenant plus de collagène nécessitent une cuisson plus longue et à plus haute température. Dans ce dernier cas, il se produit une exsudation importante d'eau lors de la cuisson. En conséquence la texture est sèche, hétérogène et dure. Le rendement en viande diminue du fait de l'exsudation.

Pour remédier à ces inconvénients et obtenir la tendreté et la jutosité recherchée avec un rendement amélioré, on incorpore généralement des polyphosphates à la viande crue, par exemple sous forme de marinade. Cette addition rencontre de la résistance chez les consommateurs car, si les polyphosphates retiennent l'eau lors de la cuisson, et assurent la tendreté souhaitée, ils masquent généralement la texture fibreuse de la viande en lui procurant une texture proche de celle des produits de charcuterie. Par ailleurs, les polyphosphates sont de plus en plus contestés sur le plan nutritionnel.

On a proposé, par exemple selon la demande de brevet européen EPA 31.631, d'incorporer des protéines de lactosérum natives dans la viande crue comme agent d'extension de celle-ci. Nous avons constaté que cette méthode présentait des inconvénients d'ordre technique, l'incorporation des protéines natives à fort pouvoir moussant étant difficile, et d'ordre organoleptique, la texture n'étant pas satisfaisante.

L'invention permet de pallier les inconvénients exposés ci-dessus.

Le procédé selon l'invention, dans lequel on traite la viande avec une marinade contenant des protéines lactiques de manière à absorber complètement la marinade, est caractérisé par le fait que l'on incorpore dans la viande crue 0,5 à 2,5% en poids de protéines de lactosérum dénaturées thermiquement.

La viande peut être par exemple de porc, de boeuf, d'agneau, de veau, de volaille, par exemple de poulet ou de dinde ou de gibier. Elle peut être choisie parmi les morceaux nobles pauvres en matière grasse et en collagène, par exemple le filet mignon, la longe, la noix de porc ou de veau, la macreuse de boeuf, le blanc de poulet ou de dinde.

Elle peut être constituée de morceaux moins nobles, contenant plus de matière grasse et de collagène, par exemple le collier de boeuf, de veau ou d'agneau, la noix de hachage de porc, le jarret de boeuf, de veau, de porc ou d'agneau, le pilon ou le haut de cuisse de poulet ou de dinde.

Les dimensions des morceaux peuvent varier du muscle entier, aux cubes, tranches ou hâchis.

Les morceaux sont de préférence parés, c'est-à-dire débarrassés de la plus grande partie de la graisse visible, des tissus conjonctifs et nerveux.

Les protéines de lactosérum proviennent de lactosérum doux de fromagerie, dont le pH est ajusté à 6-7.

Elles subissent un traitement thermique de dénaturation. Le taux de dénaturation visé est 50-90%. On exprime ce taux par le rapport:

$$\frac{\text{azote total - azote soluble}}{\text{azote total - azote non-protéique}} \times 100$$

par analyse classique de l'azote selon la méthode de Kjeldahl.

La dénaturation peut intervenir sur le lactosérum tel quel ou concentré, par exemple à environ 15% de matière sèche, par exemple par évaporation sous vide.

Le traitement thermique peut être réalisé par charges, par exemple dans une cuve à double paroi sous agitation ou en continu, dans un échangeur thermique par exemple à surface râclée, à plaques ou tubulaire ou encore dans un stérilisateur à ultra haute température. La température et la durée du traitement peuvent être adaptées au taux de dénaturation recherché, et être par exemple 95-125°C, respectivement 3 à 30 min, la température la plus élevée étant associée à la durée la plus faible.

Il se produit une floculation. On neutralise la dispersion au moyen d'une solution basique, puis on concentre la dispersion par ultrafiltration jusqu'à environ 20 -22%, de matière sèche. Cette opération permet

d'enrichir la dispersion en protéines de lactosérum, par exemple à 30-40% en poids de la matière sèche, en éliminant une partie du lactose et des minéraux. On sèche enfin le rétentat par exemple par pulvérisation.

Les protéines sériques dénaturées (PSD) constituent 0,5 à 2,5% et de préférence 0,8 à 1,6% en poids de la viande crue. Selon l'invention, et par souci de clarté, la quantité de protéine dénaturée doit être comprise en fait comme la quantité théorique de protéine pure et non pas comme la quantité de concentrat protéique tel qu'obtenu en pratique. Par contre dans les exemples, les quantités incorporées sont relatives au concentrat.

Basé sur la marinade, le concentrat de protéines sériques représente 9 à 20% en poids. La marinade peut contenir d'autres ingrédients tels que des hydrates de carbone, par exemple, amidon, lactose, glucose, maltodextrine, du sel, des épices et aromates.

De préférence, la marinade contient 7 à 13% en poids d'amidon non gélifié.

Du fait de leur état dénaturé, les protéines ne gélifient pas lors de la cuisson ultérieure. La gélification est assurée par l'amidon. Dans le système gélifiant préféré, les protéines sériques dénaturées interviendraient pour structurer le gel par liaison avec les fibres musculaires, ceci n'étant bien entendu qu'une hypothèse. La stabilisation de la texture ainsi réalisée s'opposerait à une rétraction des fibres lors des traitements thermiques successifs, par exemple de cuisson, de congélation et de régénération lors de la préparation ménagère - en agissant sur la tendreté de la viande. L'amidon responsable de la formation du gel stabilise l'eau présente dans le muscle et évite les exudations excessives lors des traitements thermiques successifs.

Ainsi, le choix de l'amidon et sa concentration sont adaptés au mode de cuisson courte ou longue. Dans une cuisson courte, appropriée pour les viandes maigres de qualité supérieure, par exemple à environ 70-80 °C à coeur pendant 15 à 25 min, l'amidon de tubercules, par exemple de pomme-de-terre est particulièrement approprié. Lorsqu'on veut traiter des viandes de moindre qualité plus riches en collagène, une cuisson longue, pendant 3 à 4h, à une température à coeur de 90-100 °C nécessite un amidon résistant aux hautes températures, par exemple un amidon de céréales, particulièrement de maïs modifié, réticulé. Bien entendu, l'amidon peut être choisi parmi les sources conventionnelles par exemple le riz, le blé ou le maïs.

Pour préparer la marinade, on dissout d'abord les ingrédients autres que les PSD et l'amidon dans l'eau froide par exemple à 4 - 20 °C. On incorpore ensuite l'amidon et en dernier lieu les PSD sous forte agitation. L'amidon n'étant pas soluble à froid, on peut soit augmenter la viscosité de la solution en y ajoutant un épaississant, soit de préférence maintenir une agitation permanente avant ou pendant l'incorporation de manière à éviter la sédimentation de l'amidon qui conduirait à une répartition irrégulière des constituants de la marinade.

La quantité de marinade incorporée dans la viande peut être 10 à 20% en poids de la viande crue.

Le mode d'incorporation de la marinade peut être pour les morceaux l'injection au moyen d'aiguilles suivie d'un barattage, de préférence sous un léger vide, permettant la pénétration et la distribution uniforme à coeur de la marinade. Dans certains cas, par exemple pour la viande de volaille, les petits morceaux ou la viande hâchée, un barattage suffit. La durée du barattage ne doit pas être trop longue de manière à préserver l'intégrité des morceaux. Elle est par exemple de 10 à 30 min.

Le traitement avec la marinade est effectué de préférence à basse température de 0 à 10 °C après que la viande ait été tempérée à une température de -3 °C à 4 °C.

Selon la nature de la viande et des morceaux, on peut effectuer une cuisson courte ou longue ou encore sous pression. On peut rissoler les morceaux préalablement à leur cuisson. Dans ce dernier cas, il est avantageux d'enrober les morceaux avec une marinade d'enrobage à base d'huile préalablement au rissolage. Une telle marinade peut contenir par exemple de la sauce soja, de l'extrait de viande, du glucose, de l'huile pour friture, des épices. On peut l'appliquer à raison de 3 à 7% en poids de la viande crue par simple malaxage.

La cuisson peut être en mijoté, par exemple en présence d'un fond de cuisson avec séparation du jus de cuisson par égouttage, puis après cuisson et refroidissement, réincorporation d'une sauce comprenant le jus et conditionnement en présence d'une garniture, par exemple de légumes dans un emballage.

On peut en variante effectuer la cuisson dans un emballage, par exemple en boyau ouvert le cas échéant après rissolage des morceaux, puis après cuisson séparer le jus par égouttage et fermer le boyau. La viande peut dans ce cas constituer un produit intermédiaire destiné à une utilisation différée dans un plat préparé.

Après cuisson et refroidissement, la viande ou le plat préparé contenant la viande peut être conditionné, réfrigéré, congelé ou encore stérilisé.

Les produits obtenus selon l'invention peuvent être régénérés par traitement dans l'eau bouillante, aux

microondes ou dans un four à infra-rouge ou à gaz.

Les viandes ont une texture stabilisée dans le temps, c'est-à-dire homogène, constante et précisément définie malgré les traitements thermiques de congélation et de régénération. Elles ont d'excellentes propriétés organoleptiques, en particulier une bonne jutosité, une bonne tendreté et une bonne saveur. Grâce au procédé selon l'invention, la texture d'origine des viandes est préservée tout au long du traitement, à l'entreposage et à la régénération. Le rendement du procédé est similaire à celui pouvant être obtenu par incorporation de polyphosphates.

Les protéines de lactosérum ont un effet de blanchiment souhaité sur les viandes de volaille.

Les exemples ci-après illustrent l'invention. Dans ceuxci, les pourcentages sont pondéraux. Dans ces exemples, le rendement global est exprimé comme le pourcentage pondéral de viande obtenue en fin de traitement par rapport à la viande initialement mise en oeuvre.

Le rendement à la cuisson est le pourcentage pondéral de viande obtenue après cuisson par rapport à la viande marinée, soit:

$$\frac{\text{viande cuite (non refroidie mais le cas échéant égouttée)}}{\text{viande + marinade}}$$

Exemples 1-6

1. On concentre du lactosérum provenant de la fabrication de camembert contenant 6,5% de matière sèche composée de 75% de lactose, 12% de protéine, 8,8% de minéraux et 5% de matière grasse, jusqu'à 15% de matière sèche par évaporation. Le pH initial de 6,3 tombe à 6,1. On traite ensuite thermiquement le concentrat à 95° C pendant 30 min. dans une cuve à double paroi sous agitation. Il se forme un floculat. On neutralise la suspension à pH 7 par addition d'une solution aqueuse d'hydroxyde de sodium. Après avoir ajusté la température de la suspension à 50° C on l'ultrafiltre dans un module muni de membranes de 20'000-40'000 dalton de zône de coupure des poids moléculaires jusqu'à ce que le rétentat ait 21-22% de matière sèche. On sèche enfin le rétentat par pulvérisation.

Les protéines sériques dénaturées obtenues ont la composition ci-après:

		%
Matière sèche dont		96
	Protéine 40	
	Matière grasse 5	
	Lactose 38	
	Minéraux 13	
Eau		4

Leur taux de dénaturation (méthode de Kjeldahl) est 80%.

2-6. On procède comme à l'exemple 1 ci-dessus sauf que l'on effectue le traitement thermique de dénaturation au moyen des appareils indiqués dans des conditions de température et de durée du traitement indiquées dans le tableau 1 ci-après, en partant de lactosérum à 6,5% de matière sèche, c'est-à-dire non concentré:

Tableau 1

Exemple	Appareil	Température (°C)	Durée (min.)	Taux de dénaturation (%)
2	Echangeur à surface râclée	110-112	6	70
3	Echangeur à surface râclée	107	5	60
4	Echangeur à plaques	110-112	6	70
5	Echangeur à plaques	95	5	50
6	Appareil de stérilisation UHT (ultra haute température)	125	3	70

Exemple 7

On décongèle un morceau de longe de porc parée, dégraissée de 0,3 kg dans une armoire de tempérage maintenu à 4°C. La pièce de viande a un pH de 5,5-5,8. Au moyen d'une injecteuse multi-aiguilles, on injecte au coeur du morceau une marinade représentant 15% de la viande crue. La marinade d'injection a la composition suivante:

	%
Protéines sériques dénaturées (PSD) selon l'exemple 1	18
Glucose cristallisé	7,9
Sel	4,9
Eau	69,2

Elle est préparé par dissolution dans l'eau froide du sel et du glucose, puis incorporation des PSD sous agitation vigoureuse. Après l'injection, on soumet la viande à un malaxage à 10°C pendant 30 min. après l'avoir enrobé avec une marinade d'enrobage. La marinade d'enrobage représente 7% de la viande crue et a la composition suivante:

	%
Hydrolysat, extrait de viande	49
Amidon natif	12
Huile végétale	20
Sucre réducteur	6
Eau	13

On traite ensuite la viande par cuisson courte, à basse température dans un four à humidité contrôlée jusqu'à une température à coeur de 75° C. On refroidit alors la viande à 15° C dans un tunnel ventilé. Après découpe en tranches, on place la viande avec une sauce dans un sachet en matière plastique souple résistant à l'ébullition que l'on ferme hermétiquement. Enfin, on congèle les sachets à -30° C.

Le rendement à la cuisson est 78% et le rendement global 93%.

Exemples comparatifs A-D

A. A titre de comparaison, le rendement à la cuisson est 74% et le rendement global 81% dans le cas d'une viande dans laquelle l'on n'a pas injecté de marinade. Par ailleurs, après régénération dans l'eau bouillante pendant 15 min., la température à coeur étant 60° C, la texture est jugée onctueuse et tendre pour la viande injectée alors que la viande non-injectée a une texture sèche, dure et hétérogène.

B-D. Dans le but de montrer les avantages de l'injection de protéines sériques dénaturées thermiquement par rapport à celle de protéines sériques natives, on réalise la cuisson de longe de porc comme à l'exemple 7 à celà près que la marinade d'injection contient 8%, (exemple C), respectivement 12% (exemple B) de protéines sériques natives selon leur composition de manière à obtenir une teneur en protéine sérique de 0,95% dans la viande crue après une injection de 15% de marinade par rapport à la viande crue. La marinade contient également 4,6% de sel, le complément à 100% étant de l'eau et du glucose. Dans l'exemple D, il n'y a pas d'injection. La régénération a lieu comme indiqué à l'exemple comparatif A ci-dessus. Les résultats relatifs au rendement et à la texture sont indiqués dans le tableau 2 ci-après.

Tableau 2

Exemple	Protéine sérique	Rendement à la cuisson (%)	Texture	
			Note moyenne de dégustation[1]	Commentaire
B	Native, obtenue par ultrafiltration, à 60% de protéine	78	7	D'abord moelleuse, puis sableuse en fin de mache
C	Native, obtenue par chromatographie par colonne, à 90% de protéine	68	6	Sèche[2]
D (sans injection)	---	74	5	Sèche, dure et hétérogène
7 (rappel)	PSD, à 40% de de protéine	78	7 - 8	Moelleuse et régulière

Légende:
1. Plus la note est élevée, meilleure est la texture.
2. Dans le cas de l'exemple C, l'utilisation de cette protéine est difficile car elle foisonne lors de sa dissolution.

Au cours des essais, les PSD ont présenté des avantages certains par rapport aux protéines natives:
- Elles sont facilement dispersibles dans l'eau sous forte agitation et n'ont pas les propriétés moussantes des protéines sériques natives.
- Les PSD n'ont pas de propriétés gélifiantes à la chaleur. Les protéines sériques natives, par contre, ne gélifient pas totalement dans les conditions de cuisson utilisées. Ceci explique le caractère sableux observé dans l'exemple comparatif B, dû semble-t-il à la présence de particules protéiques en

suspension et non encore gélifiées.

- Les PSD ont la capacité de retenir davantage d'eau et de jouer le rôle de liant, ce qui donne à la viande une texture stabilisée plus juteuse, moelleuse et homogène.

Exemples 8-12

On traite différents morceaux de viande comme à l'exemple 7 en utilisant une marinade d'incorporation à raison de 10 ou 20% par rapport à la viande crue. La marinade d'incorporation a la composition suivante:

	%
Concentrat de PSD selon l'exemple 1	9 - 15
dont 40% de protéine	3,6 - 6
Amidon de pomme-de-terre	9 - 12,7
Lactose	6
Sel	4,5
Eau	complément à 100

Pour préparer la marinade, on dissout d'abord le sel et le lactose dans l'eau à 10°C dans un bac puis on incorpore l'amidon et les PSD sous forte agitation. Pour éviter la sédimentation de l'amidon qui ne se dissout pas à 10°C, on maintient une agitation permanente dans le bac pendant l'incorporation dans la viande.

On incorpore la marinade ci-dessus soit par injection, soit par barattage. Dans ce dernier cas, le barattage dure 15 min. et on n'utilise pas de marinade d'enrobage. Les conditions du procédé et les résultats obtenus sont indiqués dans le tableau 3 ci-après.

Tableau 3

Exemple	Viande	Incorporation de la marinade, %	Marinade PSD (%)	Marinade Amidon (%)	Rendement à la cuisson (%)	Texture Note moyenne	Commentaire
8	Filet mignon de porc	Injection, 20%	15	12,7	81	8	Moelleuse et fondante
9	Epaule de veau	Injection, 10%	10,9	9	75	7-8	Homogène et moelleuse
10	Epaule de porc	Injection, 20%	15	11,5	77	8	Moelleuse
11	Blanc de poulet	Barattage, 20%	9	13	--	8-9	Moelleuse
12	Cuisse et haut de cuisse de dinde	Barattage, 20%	9	13	--	8-9	Moelleuse

Légende: - non déterminé

Exemples comparatifs E-J

A titre de comparaison, on procède à la préparation des mêmes morceaux, de la même manière soit avec injection à 20% par rapport à la viande crue d'une solution aqueuse contenant des polyphosphates (le taux de polyphosphates injectés est de 0,3%, exprimé en P_2O_5, par rapport à la viande crue, exemple E), soit sans injection (exemples F-J).

Les conditions du procédé et les résultats sont indiqués dans le tableau 4 ci-après:

Tableau 4

Exemple	Viande	Injection, %	Rendement à la cuisson (%)	Texture	
				Note moyenne de dégustation	Commentaire
E	Filet mignon de porc	Solution de polyphosphates, 20%	82	7	Moelleuse et tendre, mais "confite", sèche en cours de conservation
F	Filet mignon de porc	--	74	5-6	Sèche,dure, hétérogène
G	Epaule de veau	--	--	6-7	Sèche et hétérogène
H	Epaule de porc	--	--	6	Sèche, dure
I	Blanc de poulet	--	--	7	Sèche, aspect gris
J	Cuisse et haut de cuisse de dinde	--	--	7	Sèche, rejet de particules de viande brune

Légende: - sans incorporation, respectivement non-déterminé

Par rapport aux polyphosphates, le mélange PSD-amidon de pomme de terre permet d'obtenir un rendement pratiquement équivalent (8, comparé à E). Du point de vue de la texture, elle est moelleuse, juteuse et tendre tout en préservant les caractéristiques de la viande d'origine alors que les polyphosphates masquent la structure fibreuse de la viande, la texture "confite" étant proche d'un produit de charcuterie. La texture stabilisée obtenue selon 8 est maintenue pendant au moins 6 mois d'entreposage à -10 °C et -20 °C alors que selon E la viande se déssèche au cours de l'entreposage.

Pour le veau (9 comparé à G), l'injection de PSD et d'amidon de pomme de terre en uniformisant les textures des différents muscles constitutifs de l'épaule évite une découpe fine du morceau difficile à mettre en oeuvre industriellement.

En ce qui concerne la viande de volaille (11 comparé à I et 12 comparé à J), l'injection de PSD et d'amidon permet d'obtenir une bonne jutosité sans séparation de particules et de blanchir la viande.

Exemples 13-14

Les morceaux de viande de moindre qualité présentant plus de collagène que les viandes des exemples précédents requièrent une cuisson plus longue et à plus haute température, que dans les exemples précédents, en mijoté.
On décongèle de la viande relativement riche en collagène et on la tempère à 0-2° C. Après découpage en cubes on décongèle entièrement la viande à 4° C, puis on injecte dans les morceaux une marinade d'injection ayant la composition suivante au moyen d'une injecteuse multi-aiguilles.

	%
Concentrat de PSD selon l'exemple 1	15,2
Amidon de maïs modifié	10,8
Lactose	12,5
Sel	7,7
Eau	complément à 100

On malaxe ensuite les morceaux avec une marinade d'enrobage comme indiqué à l'exemple 7. On rissole alors les morceaux, puis on les met dans des plateaux avec un fond de cuisson. On cuit ensuite les morceaux en présence d'air saturé en vapeur de manière à atteindre une température atteinte à coeur de 95° C. Après égouttage, on refroidit les morceaux de viande, puis on les place dans des barquettes avec une garniture de légumes et une sauce. On place un couvercle sur les barquettes, on les met dans des étuis en carton et enfin on les congèle à -30° C. Après régénération en four ménager à infra-rouge ou dans un four à micro-ondes, on déguste les viandes.
La nature des viandes, les conditions de l'injection et les résultats de dégustation sont indiqués dans le tableau 5 ci-après.

Tableau 5

Exemple	Viande	Injection %	Rendement global %	Note de texture
13	Civet de porc	10	72	8
14	Boeuf bourguignon	10	70	8

Exemple comparatifs K-L

A titre de comparaison, on traite les mêmes viandes (K:porc,L:boeuf) par injection de 10% d'une

solution aqueuse contenant des polyphosphates (le taux de polyphosphates injectés est de 0,3%, exprimé en P_2O_5, par rapport à la viande crue). Les viandes avec polyphosphates obtiennent la note 7. Elles sont plus compactes, les fibres sont masquées.

Exemples 15-16

15. On hâche grossièrement de la viande de boeuf crue à 15% de matière grasse contenant 16 à 18% de collagène par rapport aux protéines, puis on y ajoute une marinade dont la composition est indiquée ci-après:

	%
Concentrat de PSD selon l'exemple 1	13,8
Amidon de maïs modifié	8,1
Sel, sucre réducteur et arôme	11
Eau	67,1

On mélange la viande avec la marinade, représentant 15% de la viande crue. On hâche alors la viande finement et on la place dans des boyaux que l'on ferme seulement à l'une de leurs extrémités. On cuit ensuite la viande dans l'eau bouillante de façon à maintenir une température à coeur > à 90° C pendant 45 min. Après cuisson, on égoutte la viande, on ferme les boyaux hermétiquement, on refroidit rapidement et on congèle.

Le rendement global constitué par le pourcentage de la viande cuite égouttée par rapport à la viande crue mise en oeuvre, est de 80-83%. A titre de comparaison, le rendement global du même procédé sans incorporation de marinade est de 62-65%.

16. On découpe en cubes de 25-30 g de la viande de boeuf crue de même teneur en matière grasse et en collagène que pour l'exemple 15 et on y injecte au moyen d'une injecteuse multi-aiguilles 15% de marinade par rapport à la viande crue.

La marinade d'injection a la composition suivante:

	%
Concentrat de PSD selon l'exemple 1	13,8
Amidons de maïs modifiés	8,1
Sel, sucre réducteur et arôme	14,5
Eau	63,6

Après l'injection, on malaxe la viande en présence d'une marinade d'enrobage à base d'huile, représentant 3% de la viande crue. On rissole ensuite les morceaux, on les place dans des boyaux et on procède à la suite des opérations comme à l'exemple 15.

Le rendement global est de 80% alors que le rendement global du même procédé sans injection de marinade est de 63%.

Revendications

1. Procédé d'amélioration de la texture des viandes à cuire dans lequel on traite la viande avec une marinade contenant des protéines lactiques de manière à absorber complètement la marinade, caractérisé par le fait que l'on incorpore dans la viande crue 0,5 à 2,5% en poids de protéines de lactosérum dénaturées thermiquement.

2. Procédé selon la revendication 1, caractérisé par le fait que les protéines de lactosérum sont dénaturées à 50-90%.

3. Procédé selon la revendication 1, caractérisé par le fait que l'on incorpore la marinade par injection et/ou barattage à raison de 10 à 22% du poids de la viande crue.

4. Procédé selon la revendication 1, caractérisé par le fait que la marinade comprend outre les protéines de lactosérum dénaturées, 7 à 13% en poids d'amidon non-gélifié.

5. Procédé selon la revendication 1, caractérisé par le fait que la viande est choisie parmi le boeuf, le porc, le mouton, l'agneau, le veau, la volaille ou le gibier et se présente sous forme de morceaux choisis parmi le muscle entier, les tranches, les cubes et le hâchis.

6. Procédé selon la revendication 1, caractérisé par le fait que l'on prépare les protéines de lactosérum dénaturées à partir d'un lactosérum doux, le cas échéant concentré par évaporation, en ajustant le cas échéant le pH à 6-6,2, en le traitant à 95-125° C pendant 3 à 30 min, en neutralisant, concentrant par ultrafiltration, puis séchant la dispersion.

7. Procédé selon la revendication 1, caractérisé par le fait qu'après avoir absorbé la marinade, la viande est cuite, refroidie, conditionnée, surgelée ou stérilisée.

8. Procédé selon la revendication 7, adapté à la préparation des viandes maigres et pauvres en collagène, caractérisé par le fait que la viande subit une cuisson courte à basse température et que la marinade contient un amidon gélifiant entre 65 et 75° C.

9. Procédé selon la revendication 7, adapté à la préparation des viandes grasses et riches en collagène, caractérisé par le fait que la viande subit une cuisson longue à haute température, et que la marinade contient un amidon gélifiant entre 90 et 100° C.

10. Viande préparée par la mise en oeuvre du procédé selon l'une des revendications 1 à 9.

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(54) **Food fluid retention system.**

(57) Foods are coated with a mixture of egg albumen, a milk protein, an unmodified starch and water to provide a system for retaining fluids in the foods, particularly those foods which are heated to cook them. To effect fluid retention in the foods, at least the coating is heated to a temperature sufficient for a time sufficient to coagulate the egg albumen, denature the protein and gelatinize the starch of the coating, at least partially, and the coated foods may be heated to cook them at least partially, thereby coagulating the egg albumen, denaturing the milk protein and gelatinizing the starch of the coating.

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BACKGROUND OF THE INVENTION

The present invention relates to treating food to enhance fluid retention within the food during preparation of the food for immediate or subsequent consumption and during storage.

A variety of compositions and means have been employed and proposed to protect foods from effects of atmospheric oxygen and moisture, to inhibit moisture migration between components of composite foods having differing moisture contents and to "extend" and/or to improve texture and/or to improve fluid retention in foods.

Food coating compositions long have been prepared from various combinations of materials as illustratively discussed in PCT Patent Application, International Publication No. WO 86/00501, which discloses preparation of a distinct and discrete dehydrated film ply which, after preparation, is placed between components of a multi-component food product to inhibit moisture transfer between components. The film is prepared from a combination of a lipid, a cellulose-ether-carbohydrate polymer and water, although it is said that a combination of a lipid and of a starch or a protein polymer, such as albumen, could be employed. The film may be embodied by separate lipid and polymer layers, or the ingredients may be combined to form a water and oil emulsion to enable production of the film in a single ply.

Verhoef, et al., U.S. Patent No. 4,935,251, disclose coating an at least partially baked pastry product, particularly croutons, with an oil and water emulsion which contains a film-forming material preferably rich in protein. The composition may be prepared with or without flour, and is intended to reduce moisture absorption.

Although alluding to possible applicability to various foods, Durst, U.S. Patent No. 3,323,922, discloses coating baked goods with a combination of a film-forming substance, a plasticizer and a liquid immiscible in the plasticizer to protect the food from oxygen and effects of humidity. It is disclosed that the film-forming substances may include a variety of materials such as protein materials, including albumen, and such as gelatinized starch. The plasticizer may be water or a glycol, for example. The immiscible liquid may include oils and various organic compositions. Fillers, including non-hydrolyzed starch, may be included in the coating composition.

Bauer, et al., U.S. Patent 3,406,081, disclose applying edible water-in-oil emulsions comprised of a fat, emulsifiers and water to coat a frozen meat to provide a continuous substantially water vapor-impervious coating.

Substantially fat-free food coatings also have been sought to address a lack of oil coating effectiveness of edible oil and oil-containing coatings when the coated products are heated. To address that and other problems, European Patent Application Publication No. 0 393 361 discloses coating a food with a composition which was found to be particularly useful for preventing moisture migration in a multi-component food product between food materials having differing moisture contents. As disclosed, egg, milk protein and water are mixed, coated upon a food and then heated to a temperature of from 70 °C to 100 °C, which is disclosed to be critical, to coagulate the egg. The food upon which the composition is coated is usefully a less moist component of the composite food product.

As also disclosed by the European Application, the composition advantageously may include a modified, i.e., gelatinized, starch to improve bonding and adhesion of the egg and milk protein to the food. As disclosed, the contents of the components should not fall appreciably below or exceed limits of from 3% to 12% egg, from 3% to 18% milk protein and from 7% to 12% gelatinized starch, by weight. It is taught that if the amounts fall below these limits, the coating would be less impermeable with a less resistant texture, and that if the amounts exceed the upper limits, the coating would be too thick and too hard, and would be noticed by the consumer.

As is appreciated in the art, fluid retention and texture deterioration are problematical during preparation of so-called convenience foods which are refrigerated, and usually frozen. Fluid retention and texture deterioration are particularly problematical in the case when a food is cooked prior to being refrigerated or frozen for storage, so that the consumer need only heat the food to a temperature desirable for consumption. Because of fluid loss, a dry, fibrous, tough texture is imparted to the foods, which makes them less desirable than fresh foods to a discerning consumer.

Cooking losses incurred by meats, for example, may range up to from about 20% to about 30% by weight based upon the weight of the product prior to cooking, by reason of fluid loss during cooking. Additionally, freezing procedures, particularly procedures such as blast freezing, as is known in the art, may contribute to further fluid loss and texture deterioration. Moreover, further fluid losses may occur during storage and generally will occur upon reheating for consumption.

As also will be appreciated, further problematical are food products wherein a food, such as a meat, or vegetables, is cooked and combined with a sauce and then stored. Although the art has focused upon

inhibiting moisture transfer from a more moist food component to a less moist food component of a composite food to prevent the less moist component from becoming soggy, such as in the case of a pizza, for example, the problem with combining particularly a meat with a sauce has been found to be different. Because meat, even though it could be considered a less moist component when contained in a sauce, itself contains a substantial amount of fluids, the fluids transfer out of the meat into the sauce and thereby dilute the sauce and impair the viscosity and character of the sauce, and the meat, even though contained in a fluid-containing sauce, acquires a dry, fibrous, tough character. In addition, the problem becomes even more acute when a product of this nature is retorted, as is common in the art.

Additionally, of particular recent interest in convenience food preparation is a method known as *sous vide*, which is employed for providing microbiologically stable vacuum packed foods, including meats, and particularly fish, which require only heating to a desirable temperature for consumption. In this process, a raw meat is placed in a pouch, preferably transparent, which then is vacuum sealed. The pouch containing the meat is heated, generally by placing it in a water bath which has a temperature of from about 60 °C to about 75 °C until the meat reaches an internal core temperature ("ICT") which is considered sufficient to at least make the meat microbiologically stable for storage, i.e., generally 60 °C and above. Then, the meat is held at the stated temperature for about 15 mins to about 20 mins. The pouch and contents then are chilled to a refrigeration temperature, i.e., generally about 4 °C to about 8 °C, and/or frozen.

However, when preparing products such as meat in the *sous vide* manner, although the objective of the process is to provide a convenience product having the appearance and characteristics of a fresh product when purchased and prepared for consumption, that objective has not been able to be realized effectively. Problems are particularly acute for fish because it loses fluids readily and becomes not only dry, fibrous and tough upon consumption, but also the product is not aesthetically pleasing in the package because of fluids which exude from the products.

One means employed to attempt to obtain a final sous vide product containing sufficient fluids and moistness has been to marinate the raw meat prior to vacuum packing it. However, on one hand, the marination tends to impart a texture to the meat which is not characteristic of conventionally cooked fresh meat, and on another hand, because the marination fluids tend to separate from the solids, the solids tend to form into a granular type consistency during the ICT cooking and during preparation for consumption.

Additionally, in the *sous vide* process, and for that matter in preparation of other meat or meat-containing convenience foods, it often is preferred to sear or grill the meat first to impart color to the meat to effect a desirable aesthetic effect. That, however, generally also results in a fluid loss which may range, depending upon the meat, up to about 10% by weight which, as is evident from the above discussion, contributes to a final product having a dry, fibrous, and tough texture.

Moreover, in the *sous vide* process or with a boil-in-bag type products, as are known also in the art, and which contain meat, for example, moisture generally separates from the meat during any preparative heating process and during storage in a further amount of from about 5% to about 15% by weight. As noted above, that presents an unappealing appearance in the package, even if an absorbent material, which is sought to be avoided, is included in the package to soak up fluids.

In addressing certain problems arguably analogous to those noted above, to prepare a "luncheon" meat product, Lindl, *et al.*, U.S. Patent No. 4,071,635, disclose incorporating and blending a dry composition of starch and protein components within a mass of comminuted meat to "extend" the meat. In the Lindl system, which is disclosed as also affording reduction of cooking loss, the starch component is disclosed as acting not only as a filler-extender, but also as a fat and water binder which acts within the product mass to inhibit escape of fluids from the mass. The protein is disclosed as fulfilling a texture function to improve chewability characteristics, which are said to be affected adversely by the starch.

As taught by Lindl, *et al.*, the starch of the dry composition preferably is modified, i.e., gelatinized, corn starch, and may be employed in an amount of from 25% to 85% by dry weight based upon the weight of the dry composition. The protein, of which at least a part is egg albumen, may be employed in an amount of from 1.5% to 55% by dry weight, based upon the weight of the dry composition. The dry composition is added to the comminuted meat to be treated, and although some water may be added to the meat prior to addition of the dry composition, the majority of water is added to the meat upon addition of the dry composition. Water is employed in an amount, by weight, of from 1.5 to 4 times the weight of the dry composition, which may provide a meat to dry mix/water ratio of from 1:0.25 to 1:2.5. After mixing, the meat mixture is molded and then cooked.

To reduce cooking loss of uncomminuted whole pieces of meat, starches, including modified, i.e., gelatinized, starches, and proteins also have been disclosed as being employed as components of marination media which are sought to be impregnated within the meat mass to effect retention of fluids within the mass. Commonly, marinades are a dilute suspension of such components and may be added to

whole pieces of uncomminuted meat generally by injection, as illustrated, for example, by Savage, *et al.*, United States Patent No. 3,506,455, although soaking and tumbling marination procedures to impregnate the meat also are known. As disclosed by savage, starches and proteins are sought to be incorporated within the interior of the meat pieces in an amount of from 1% to 15% by weight of the impregnated meat. The impregnation media may include an medium, wherein it is taught that encapsulation of the starch and protein ingredients is desired to enable them to retain their water-binding capacity. A fat or oil medium also may be employed.

It also has long been practice in the convenience food preparation art to attempt to improve the appearance of foods by applying a batter, particularly flour-based batters, to the foods to enable a coating of bread crumbs or other farinaceous material to be applied on the foods for the purpose of achieving a browned appearance. Generally, the coated foods are deep-fat fried, although such may be baked. Such processes, however, have little effect upon fluid loss and, in fact, a significant problem in the art is that upon cooking for consumption, the crumb coatings become undesirably soggy. Thus, such systems do not provide guidance for one seeking to obtain a product having a fresh shelf appearance or an appearance, upon heating for consumption, which is similar to the appearance of a cooked fresh product.

An approach which is said to promote moisture retention in foods, such as cooked or raw meat or vegetables, is disclosed in UK Patent Application 2 097 646, wherein a food is coated with a substantially fat-free, flour-based batter which contains an egg white substitute which is contained in the batter in an amount of from 0.5% to 10% by weight on a dry weight basis. The egg white substitutes are disclosed as being preferably a globular proteinaceous material which is soluble in water and coagulable with heat, although such may include egg albumen "extended" with a proteinaceous or non-proteinaceous material.

Said to be a particularly preferred component of the coating composition, as set forth in the UK disclosure, is a substitute identified as MERI-WHITE, which variously is disclosed as containing an egg albumen content of up to about 28%, and starch, which includes modified, i.e., gelatinized, starch, in an amount greater than the amount of the albumen. It is disclosed that the substitutes alternatively may be based upon whey, which is said to contain about 30% lactalbumen, or upon whey protein isolates, which are said to have a protein content of between 20% and 30%.

As disclosed in the UK Application, the "typical" process employs, just as in prior art breading processes, deep-fat frying the coated food. Hence, the flour-based coating will take up cooking fat or oil which may act, in effect, as a further coating material, the coating will have a distinct, apparent browned coating, and excess frying oil must be removed from the product.

SUMMARY OF THE INVENTIONS

The present inventions include a process for treating a food characterized in that a mixture of egg albumen, milk protein, an unmodified starch and water ingredients are prepared, and then, the mixture is coated on an exterior surface of a food product mass to be heated for immediate or subsequent consumption. To achieve the objects and advantages of the present inventions, the ingredients must be present in the mixture in amounts, by weight, of at least about 5% egg albumen, at least about 5% milk protein, at least about 25% unmodified starch and at least about 40% water, each weight being based upon the weight of the mixture.

Although, as discussed further below, the mixture may include a modified, i.e., gelatinized, starch, when a modified starch is included in the mixture, the amount of the modified starch must not exceed about 6% by weight based upon the weight of the mixture. Preferably, if employed at all, modified starch is employed in amounts only on the order of up to about 3%, and preferably only up to about 2%, by weight based upon the weight of the mixture.

Preferably, however, no modified starch is employed, and in that case, the unmodified starch is employed in an amount of at least about 30% by weight based upon the weight of the mixture.

In addition, as a preferred embodiment, it has been discovered that addition of an edible oil provides an emulsifying effect and tends to provide improved homogeneity to the ingredients of the mixture. It also has been found that an oil advantageously provides a more flexible, or elastic, coating which enhances the effectiveness of the coating by inhibiting a potential of coating cracking which may result in localized leakage.

Salt (NaCl) also advantageously may be added to the mixture, particularly if the mixture is to be left standing over extended periods of time, since it is believed to have a beneficial effect upon stability of the mixture.

In addition, seasonings, exclusive of salt, and flavor ingredients, or flavor precursors, for example, and other materials in amounts which do not affect the basic physical characteristics and properties of the

coating mixture, particularly its fluidity and adhesiveness, such as will be found with modified starch and flours, also may be employed in the mixture. Hence, flours, also, although such might be employed in the mixture in small amounts, preferably are excluded.

The present inventions also include the resultant product mixtures described above, with or without water, and include food compositions wherein a food contains a coating of the mixture compositions described above.

To effect the benefits of the present inventions, such are characterized further in that the coating of the coated food product is heated to at least a temperature and for a time sufficient to, at least partially, coagulate the egg albumen, denature the milk protein and gelatinize the unmodified starch to obtain a heat-treated coated food product. Alternatively, the coated food product is heated to a temperature and for a time sufficient to cook the food at least partially, thereby also coagulating the egg, denaturing the milk protein and gelatinizing the starch to provide an at least partially cooked food product.

Also included in the present inventions are heat-treated food products coated with the mixture compositions described above, wherein the egg, milk protein and starch are, respectively, at least partially coagulated, denatured and gelatinized, and also included are at least partially cooked coated food products wherein the albumen, protein and starch are coagulated, denatured and gelatinized, respectively. Particularly preferred products are whole coated meat pieces, including cooked coated meat pieces contained in an edible sauce.

A further embodiment of the present inventions, which is particularly useful for treating raw fish, includes the process of preparing mixture compositions described above, coating the same on a food, vacuum packaging the coated food and then heating the packaged coated food to a sufficient internal core temperature (ICT) for a time sufficient to render it microbiologically stable. Preferably, and particularly if a sauce is packed with the coated food, at least the coating is heated, prior to vacuum packing, to a temperature sufficient and for a time sufficient to, at least partially, coagulate the egg, denature the protein and gelatinize the starch. Such products may be refrigerated and/or frozen prior to consumption. To enhance the aesthetic appearance of the product, the coated food advantageously is subjected to grilling, to place grill marks thereon, or to an analogous searing heat to color the food, which thereby operates to, at least partially, coagulate the egg, denature the protein and gelatinize the starch and generally, to at least partially cook the food.

A further embodiment includes the process and product of packaging the coated products, as described above, cooked or uncooked, with or without an edible sauce, in boil-in-bag packaging as is known in the art.

Further particularly advantageous embodiments include the process and product of combining the coated food products with a sauce and retorting the combined product with retorting procedures as are known in the art, preferably after having at least heated the coating to, at least partially, coagulate the egg albumen, denature the protein and gelatinize the starch.

Particularly when the coated food is to be combined with a sauce, most desirably, the coated food is heated sufficiently so that substantially all of the egg albumen, milk protein and starch are, respectively coagulated, denatured, and gelatinized.

As will be found from employing the mixtures of the present inventions, and by proceeding in accordance with the processes of the present inventions, cooked products, particularly in the area of convenience foods, are obtained which have a significantly higher cooked weight and organoleptic and aesthetic appeal than if the products were not treated with the coating mixtures of the inventions. The inventions also avoid the necessity of treating an interior mass of foods, and thus enable one to avoid marination, tumbling and injection procedures of the art to obtain fluid retention. Additionally, in contrast to the batter and breading coatings of the art, including the aforenoted UK Application, a product wherein the coating material is not readily perceptible to the untrained eye is obtained, because the coating enables obtaining a substantially unobtrusive film.

DETAILED DESCRIPTION OF THE INVENTIONS

The coating of the inventions is particularly applicable for application to raw foods, which are herein meant to include fresh and frozen raw foods. Meat, which is meant herein to include all kinds of meats, including red meat, poultry and fish meats, is treated most advantageously. The treated foods may be employed for preparation of cooked and refrigerated, and/or frozen, products which merely require heating for consumption, for example. The foods may be cooked by such as by frying, including stir-frying, grilling and/or baking, and the afore-noted *sous vide* and boil-in-bag and retorting processes. Of course, however, cooked or partially cooked and/or seared or blanched meats and vegetables may be treated. Pastas and breads also may be treated advantageously.

In the present inventions, "whole" foods are treated as opposed to ground or comminuted foods. "Whole" foods are intended to include discrete pieces of foods, large and small, which have not been subjected to a comminution or grinding procedure which thereby requires a mixing procedure, rather than a coating procedure, to incorporate additives and which thereafter requires molding or otherwise forming the food to obtain discrete reformed pieces. Whole foods, however, also are intended to include ground or comminuted foods which have been molded or otherwise reformed into a mass, and in this context, in accordance with a process of the inventions, the outer, or exterior, of the formed mass is coated.

In the practice of the present inventions, the egg albumen must be present in the mixture in an amount sufficient so that a substantially continuous film of the albumen can be and is coated on the food and so that upon heating of the coated food, thereby resulting in coagulation of the albumen, the coagulated albumen inhibits escape of water from the food. To effect this result, the amount of egg albumen employed should comprise at least about 5%, and preferably at least about 6%, by weight based upon the weight of the mixture to be applied to the food as the coating, and when coated on the food, the egg albumen will comprise at least about 0.25%, and preferably at least about 0.3%, by weight based upon the weight of the food to be coated.

Generally, for best results, egg albumen may be employed in the mixture in an amount of from about 6% to about 11% by weight based upon the weight of the mixture, and preferably from about 6% to about 10% by weight. Also for best results, although such is to some extent food product dependent, it has been discovered that it is not desirable to employ egg albumen in an amount more than about 12%, and preferably not more than about 11%, by weight, since it has been found that, depending upon the particular application, such may affect texture, mouthfeel and flavor of the product adversely by imparting a tough "bite" characteristic and by imparting sulfur notes and/or slight bitterness to the product.

The milk protein is employed also in an amount sufficient to coat the food uniformly with the protein so that upon heating of the coated food and denaturation of the protein, the protein swells and, together with the coagulated albumen, seals the surface of the food to inhibit escape of fluids from the food by forming a substantially continuous film. The amount of milk protein employed should comprise at least about 5%, and preferably at least about 6%, by weight based upon the weight of the mixture to be applied to the food as the coating, and when coated on the food, the milk protein will comprise at least about 0.25%, and preferably at least about 0.3%, by weight based upon the weight of the food to be coated.

Generally, for best results, the milk protein is employed in the mixture in an amount of from about 10% to about 19% by weight based upon the weight of the mixture and preferably from about 15% to 18% by weight.

In general, for best results, when amounts of egg albumen on the order of from about 5% to 6% by weight of the mixture are employed, it is desirable to employ greater amounts of milk protein, preferably, amounts on the order of up to about 20% by weight. Amounts of egg albumen and milk protein less than a total of about 10% by weight (mixture weight) and 0.5% by weight (based on food weight) will not provide desirable fluid retention, and amounts greater than a total of about 25% by weight (mixture weight) and 1.5% by weight (food weight) tend to result in a less than desirable perception of texture.

Again, in general, the total amount of egg albumen and milk protein is preferably in an amount of from about 15% to about 20% by weight based on the weight of the mixture. Thus, when employing egg albumen, for example, in an amount of about 6% by weight, milk protein is employed in an amount of at least about 9% by weight, each weight being based upon the weight of the mixture.

The milk protein employed in the present invention is undenatured so that it may be heat-set, i.e., denatured by heat, after it is coated on the food. Although a variety of proteins known in the art may be employed, as will be appreciated, the protein, as well as any other ingredient, should be one which is food-acceptable, a primary consideration, however, being the impact of the flavor the milk protein imparts to the final coated product. For example, caseinate is less preferred because it generally is found to impart a bitter taste to the final product.

Particularly useful milk proteins include those obtained from skim milk, whey and milk protein concentrates and isolates and other products including but not limited to low lactose whey powder. A whey protein concentrate known as LACPRODANE 80 protein concentrate has been found to provide particularly desirable results.

It is essential that an unmodified, i.e., not gelatinized, starch be employed to enable applying, particularly in the cases of raw foods, including particularly meat, an effective coating to the food. Although it is sought that the egg albumen and milk protein components provide the primary fluid retention function of the coating, as will be appreciated upon practice of the present inventions, after the unmodified starch has been coated on the meat and heated, it then has the ability to operate to take up moisture which may escape from the food. It also has been discovered, however, that the starch contributes elasticity to the

albumen and milk protein elements which acts to relieve stress upon those elements, which thereby inhibits the potential of coating cracking and thus further enhances the effectiveness of the coating by reducing the potential for localized leakage. By providing elasticity, the starch thereby also reduces the necessity of the starch having to act as a moisture absorber.

The mixture must contain unmodified, i.e., ungelatinized, starch in an amount of at least about 25% by weight based upon the weight of the mixture, and when coated on a food, the unmodified starch will be in an amount of at least about 1.5% by weight based upon the weight of the food to be coated.

On the other hand, as noted above, it also has been discovered that modified, i.e., pregelatinized, starch, while not being able to fulfill the functions of the unmodified starch, may be employed advantageously in the mixture as an additive to act as a suspension stabilizer which may assist, particularly when particulate condiments, such as seasonings, are included in the mixture. However, modified starch has a substantial effect upon the fluidity, i.e., the viscosity, of the mixture. That is, it alters the basic character and affects the ability to apply an effective coating to the foods, and to combat that, water in amounts greater than desired may have to be employed which, as discussed below, is not desirable for coating effectiveness.

Hence, pre-gelatinized starch in amounts greater than about 6% by weight based upon the weight of the mixture are not employed. To obtain desirable results of suspension stabilization of added condiments, i.e., spices, for example, amounts only on the order of from about 2% to about 3% by weight, based upon the weight of the mixture, and preferably less, are employed, and as indicated above, it is preferred to avoid employment of modified starch. Moreover, because of the lack of perception of the coating of the invention to the untrained eye and a desire to allow the consumer to season to taste, even addition of seasoning condiments, which frequently are added to mask effects of treatments to convenience foods, is sought to be avoided.

Therefore, in what are considered most desirable embodiments, no modified starch is employed, and it is then essential that the modified starch be employed in an amount of at least about 30% by weight based upon the weight of the mixture. Preferably, the unmodified starch is employed in an amount of from about 35% to about 55% by weight based upon the weight of the mixture. As with the milk protein component, a variety of starches, which are obtained from grains and tubers, may be employed. Such starches include corn, wheat, oat, potato, tapioca and rice starches.

Water is employed in the mixture preferably in an amount sufficient to enable obtaining a flowable fluid mass. If too much water is added, the mixture is too thin and fluid, and the coating ingredient substances are too diluted to coat and/or inhibit escape of fluids from the food effectively, particularly during cooking. For example, if too much water is employed, upon storage, including refrigeration, or even freezing, fluids may have a tendency to escape the food and accumulate in the starch which, as a result, also will inhibit the effectiveness of the coating, particularly upon heating for cooking and/or consumption.

Hence, it has been found that amounts of water in excess of about 55% by weight based upon the weight of the mixture should be avoided. On the other hand, water in an amount of less than about 40% by weight results in a mixture which has an undesirably high viscosity which, in general, will result in a coating which is difficult to apply and hence, be difficult to control from a process standpoint. Moreover, in general, it will be found that such a coating will be undesirably perceptible to the untrained eye. Preferably, the mixture has a water content of from about 45% to about 50% by weight based on the total weight of the mixture.

As referred to above, an edible oil advantageously may be mixed with the mixture, since it has been found that an oil not only assists in effecting a homogeneous dispersion of the effective ingredients in the water, but also operates to provide coating elasticity to relieve stress and inhibit film cracking, hence, thereby assisting in inhibiting localized leakage. In addition, the oil generally will be found to enhance mouthfeel of the final product. Preferably, the oil is a vegetable oil and preferably is a poly-unsaturated oil to minimize the caloric content of the product. The oil may be employed in amounts of from about 3% to about 7%, preferably from about 4% to about 6%, by weight based upon the weight of the mixture.

Also as noted above, salt may be employed usefully, not as an organoleptic enhancer, but as fulfilling a function of assisting in maintaining mixture homogeneity over time by acting as a water binder in the mixture, and such will also act as a water binder in the food. Salt may be employed in amounts up to about 7% by weight, and preferably from about 4% to 6%, by weight based upon the weight of the mixture.

The mixture of starch, milk protein, egg albumen and water, with or without oil and/or salt, may be prepared simply by mixing the ingredients, with the caveat that temperatures which would tend to coagulate the albumen, denature the protein or gelatinize the starch should be avoided during mixing. Thus, in general, temperatures on the order of higher than about 50°C should not be employed during mixing. Advantageously, to obtain homogeneity, the albumen, milk protein and starch in powder form first are dry

mixed and then added to water and mixed by any of various means known to those of ordinary skill which provide reasonable homogeneity, including a simple blender or wisk means, for example.

How one coats the food is dependent upon the viscosity of the mixture and configuration of the food pieces. Although the coating may be applied by brushing, by spreading or by spraying the mixture onto the surface of the food, the coating is carried out most advantageously by immersing the food into the mixture, such as by dipping the food to be coated into the mixture. Tumbling food with the mixture is a further alternative.

As will be appreciated upon practice of the inventions as disclosed above, and particularly when applying the coating merely by immersing the food in and then removing it from the mixture, the mixture quite surprisingly has an inherent tendency to be coated on the food in an amount sufficient to provide the desired retention properties. Moreover, time of immersion is not a factor of significance in obtaining sufficient amounts of coating when the food is immersed, the key simply being that the food be brought into contact with the mixture so that its exterior becomes coated with a substantially continuous layer of the coating, note being made here, however, that the present invention does not exclude coating only a portion or portions of an exterior surface of a food.

Thus, the mixture of the present invention surprisingly presents the ability to achieve the desired results by employing, for example, continuous conveying means which provides for immersion of the food in the mixture. Hence, desired amounts of coating are obtained when food is conveyed through a bath of the mixture for a time sufficient for the coating to be applied to the exterior surface of the food. Such continuous coating operations may be carried out on a wire mesh or link conveyor device means which travels through a container holding the mixture. Desirably, the bath is agitated gently.

Moreover, since it has been found that, in general, the food pieces tend to float in the mixture, means, such as similar upper and lower parallel conveyor device means, are provided to convey and restrict the floating movement of the food pieces to be coated so that they are caused to immersed for a time sufficient to coat substantially the entirety of their outer, or exterior, surfaces. Thus, as will be appreciated, loosely "sandwiching" the food pieces between two conveyor element means, taken together with the tendency of the food pieces to float, easily enables coating substantially the entire external surface of the food pieces. Surprisingly, therefore, not only is an effective coating obtained, but minimal process control, other than mixture control within the confines of the inventions described above, is required.

Note also may be made that, in contrast to an immersion-type procedure, in which time of contact of the food with the mixture is not of particular significance, if one tumbles a food and the mixture, time to effect an adequate coating is of more significance. Depending upon amounts of food and mixture employed, one may wish to tumble for from about 3 mins to about 7 mins.

After removal from the bath, or from a tumbler, excess mixture preferably is allowed to drip off the coated food. Blowing air on the coated food also will be found to remove excess coating more quickly, and it will be found that by operating in accordance with the inventions as described above, either procedure will result in desirable coating amounts.

Although the mixture and the food may be at ambient temperature, e.g., from about 16 °C to about 25 °C, for coating, the coating application process preferably is carried out at a refrigeration temperature, e.g., about 4 °C to about 8 °C, and food may be frozen when coated, which is most advantageous for coating fish.

In general, the amount of mixture coated onto the meat may range from about 6% to about 12% by weight based on the weight of the food, and such amounts are particularly desirable for coated meats. Amounts desirably coated upon a food, however, are considered in the context of the nature of the food and its moisture content and the method of preparing the food for consumption. As will be found by practice of the present inventions, in general, coating amounts above about 13% by weight of the food to be coated become noticeable, and no significant concomitant increase in fluid retention may be realized with such amounts in any event.

After coating, although the coated food product may be packed as is, to realize the particular advantages of the present inventions, i.e., provision of an appealing convenience food which has retained a high content of its natural fluids, the coating is heated to at least a temperature sufficient to, at least partially, coagulate the albumen, denature the protein and modify the starch. Although complete denaturation and gelation are not required, it is preferred that substantially all of the albumen, milk protein and starch are coagulated, denatured and gelled, respectively. As will be appreciated, temperatures in excess of about 60 °C, and preferably in excess about 70 °C, will effect these results.

Preferably, in the case of a convenience food, the coated food product is heated to cook the food at least partially, which thereby coagulates the albumen, denatures the protein and modifies the starch. Grilling, searing, or stir-frying may be employed to accomplish this effectively and to provide an attractive

grill mark or other pleasantly colored outer appearance. Preferably, if searing, stir-frying, or other frying is performed, minimal amounts of oil, such as an amount merely necessary to prevent sticking to a pan, are employed. It is made clear, however, that deep-fat frying cooking is not excluded and is a viable cooking method.

Alternatively, the coated food product may be heated in a steam cabinet or in an oven to cook it, and the food may be marked or browned first by one of the methods noted above and then cooked in any way desired. In any event, no matter what cooking processing method is chosen, fluid losses are substantially reduced from the losses which occur when cooking the food without the coating.

The *sous vide* process also advantageously is employed, particularly in the case of fish steaks or fillets, and it will be found that the packaged fluid purge may be reduced to substantially nil by reason of employing the present inventions. Hence, the food is placed in a pouch, made of suitable food-acceptable plastic materials as known in the art, which then is sealed under vacuum, e.g., 600-650 mm Hg. The sealed pouch and contents are heated, for instance in a water bath having a water temperature sufficient, e.g., from 60 °C to 75 °C, for a time sufficient to make the product microbiologically stable. Preferably, the product is brought to an ICT of from about 63 °C to about 65 °C and held at such temperature for about 15 mins to 18 mins. Afterwards, the pouch is chilled, and then the pouch-packaged product may be frozen. Preferably, the coating first is heat-set, such as by searing, grilling, or stir-frying, to provide a pleasant cooked outer surface appearance and to coagulate the egg, denature the protein and gelatinize the starch, at least partially.

Additionally, it also has been discovered that in the case of retorted products which include sauces, problems arise, as indicated above, not so much from fluids entering a food, such as meat, contained in the sauce, but from fluids leaving the meat and diluting the sauces. By reason of fluids leaving the meat and/or by transfer of fluids between meat and a sauce, not only does the sauce lose its basic character and viscosity, but the meat becomes undesirably dry, fibrous and tough and will lose its distinct flavor. By practice of the present invention, however, the character of the meat is preserved not only by internally retaining its fluids, flavor and texture, but also, since fluid loss from the meat during the retorting and during storage is inhibited, the viscosity of the sauce is maintained.

Moreover, it has been found that employing the coating mixture compositions of the present inventions on lean meats, i.e., meats having fat contents generally on the order of from about 5% to about 15%, provides advantages not expected based upon experimentation with non-lean meats.

As will be appreciated by one of ordinary skill, lean meats, although preferred by health conscious consumers, generally are less preferred by the consumer because they lack the "richness" and mouthfeel of non-lean meats. Those characteristics are magnified when such meats are employed as or incorporated into convenience foods, wherein due to preparative cooking and refrigeration, the lean meat develops an additional dry, fibrous and tough texture. Thus, it has been discovered that the coating of the present inventions not only retains moisture but enhances the perception of richness and mouthfeel of lean meats to provide a more non-lean character.

Thus, as will be appreciated, upon practice of the present inventions, cooked food products, and meat products, in particular, may be obtained which contain substantial amounts of their natural fluids and which have a pleasant appearance and texture, as is further illustrated by the Examples below.

EXAMPLES

The following Examples, in which parts and percentages are by weight unless otherwise indicated, further illustrate the present inventions.

Example I

Whole boneless chicken breasts are trimmed to provide pieces of meat having a weight of about 75 g each.

One group of breasts is dipped into a mixture containing approximately:

Ingredients	%
Egg white powder	8.8
MELOGEL unmodified corn starch	40.6
LACPRODANE 80 milk protein	7.6
Water	43

The coated chicken breasts, after substantially all non-adhering coating has been allowed to drip off, are weighed. The coated breasts have a weight, on average, of about 82 g.

The coated chicken breasts are cooked by heating them in a steam cabinet until the breasts reach an internal core temperature of about of 74 °C, as determined by a DiGi-SENSE thermocouple thermometer. After cooling to room temperature, the cooked coated breasts are weighed, and it is found that the breasts weigh, on average, about 79 g.

One group of breasts is not coated. These uncoated breasts are heated in a steam cabinet, as above, to cook them. The cooked weight, on average, is about 59 g.

The results of this experiment are shown further by Exhibit A submitted for filing with this Application. Photograph Aa shows an uncooked breast piece. Photograph Ab shows the breast Aa after coating and cooking. Photograph Ac shows a side-by-side width comparison of an uncoated, cooked breast (left) and the coated cooked breast. Photograph Ad shows a side-by-side thickness comparison of the uncoated cooked breast (left) and the coated cooked breast. As can be seen, the coated cooked breast is substantially more plump than the uncoated cooked breast.

Example II

Whole boneless chicken breasts are trimmed to provide a pieces of meat having a weight of about 75 g each.

One group of breasts is dipped into a mixture containing approximately:

Ingredients	%
Egg white powder	8.8
MELOGEL unmodified corn starch	40.6
LACPRODANE 80 milk protein	7.6
Water	39
Corn oil	4

Coated and uncoated chicken breasts are cooked as in Example I above. Substantially the same results are achieved as in Example I above.

Photographs of breasts treated as above also are provided in the accompanying Exhibit B. Photographs Ba and Bb show uncoated uncooked and cooked breasts, respectively. Photographs Bc and Bd show coated uncooked and cooked breasts, respectively. Photograph Be shows a side-by-side view of the cooked untreated (left) and cooked coated breasts. Again, the coated cooked breast is substantially more plump than the uncoated cooked breast.

Example III

Pieces of chicken breast meat (approx. 4 cm x 2 cm x 1 cm) are prepared.

350 g of the pieces are coated with 25 g of a mixture containing, by weight, based upon the weight of the mixture, 7.75% egg white powder, 6.65% whey concentrate (LACPRODANE 80), 35.6% unmodified corn starch (MELOGEL), 5% corn oil and 45% water.

The coated pieces are stir-fried in a pan containing about 10 g of corn oil to avoid sticking of the pieces to the pan. The pieces are stir-fried until the pieces reach an internal core temperature of about 77 °C, as determined by DiGi-SENSE thermocouple thermometer. About 356 g of product are obtained, which provides a cooked yield of about 95% (based upon the weight of the coated pieces prior to stir-frying).

350 g of the chicken pieces are not treated with the coating as above, but are stir-fried in the same amount of cooking oil to substantially the same internal core temperature. About 273 g of fried pieces are obtained, which provides a cooked yield of about 78% (based upon the weight of the pieces prior to stir-

frying).

Example IV

A mixture containing the following ingredients is prepared:

Ingredients	%
Egg white powder	7.75
LACPRODANE 80 milk protein	6.65
MELOGEL unmodified starch	30.6
National 711 modified starch	5.0
Corn oil	5.0
Water	45.0

This mixture is quite viscous, and it is not particularly desirable to employ such as a coating.
A second mixture containing the following ingredients is prepared:

Ingredients	%
Egg white powder	7.045
LACPRODANE 80 milk protein	6.045
MELOGEL unmodified starch	27.820
National 711 modified starch	4.545
Corn oil	4.545
Water	50.000

The second mixture has a fluid consistency which is acceptable for coating the exterior of pieces of food. Upon coating chicken pieces prepared for EXAMPLE III, it is found that fluid retention substantially equivalent to the results of Example III is obtained.

Example V

Swordfish steaks having a thickness of about 2 cm and weighing about 160 g are dipped into the following mixture:

Ingredients	%
Egg white powder	8.00
Unmodified corn starch	40.00
Milk protein	7.00
Salt	5.00
Caramel color	0.30
Water	39.70

The steaks are grilled for about 1 min on each side on a preheated EMBERGLOW grill set on a high temperature setting for marking the steaks. That procedure coagulates egg, denatures milk protein and gells starch. The treated steaks are found to have substantially no weight loss.

The grilled steaks are placed in plastic pouches which are sealed under vacuum. The sealed pouches and contents are immersed in a water bath having a temperature of about 63 °C. When the steaks reach an ICT of 60 °C, they are kept in the bath for a further 15 minutes. The pouches and contents then are removed from the bath, chilled and refrigerated at a temperature of about 4 °C.

After two days of refrigeration, the pouches are opened to determine the amount of fluid loss from the steaks. It is found that the amount of fluid in the pouches ranges from none to 5 g.

The coated steaks removed from the pouches are heated for consumption in a microwave oven. Substantially no fluids are exuded onto the supporting surface during heating, and the steaks are found to have a flaky moist texture.

For comparison, swordfish steaks having a thickness of about 2 cm and weighing about 160 g are not treated with the coating as above but are grilled as above. After grilling, these steaks are found to have about a 5% weight loss. These steaks then are placed in a pouch and treated as above.

After refrigeration, all pouches contained substantial amounts of fluids. The pouches are opened and the fluids are collected. It is found that the pouches contain fluids in amounts of from about 15 g to 20 g.

The uncoated steaks then are heated in a microwave oven for consumption. Further fluids which have escaped the steaks are present on the supporting surface after microwave heating. The steaks are tasted and are found to be unpleasantly dry and fibrous.

Example VI

Pork butt is trimmed of surface fat and is cut into cubes of about 12 mm thickness.

1400 g of the cubes are seared in a skillet with 30 g of corn oil to prevent sticking of the meat to the pan. 965 g of fried pork cubes, are obtained.

1400 g of the cubes are coated with 120 g of a mixture of about 6.75% powdered egg white, about 34.6% corn starch, about 6.65% whey protein concentrate, about 47% water and about 5% corn oil. The coated cubes are sear fried in the some amount of oil as above and 1400 g of fried, coated pork cubes are obtained.

Each of the two portions of the fried cubes are added separately to a blend of ingredients, which comprises a sweet and sour sauce, blanched vegetable pieces and pineapple chunks, in a container which then is closed and retorted at a temperature of about 121 °C about 1 hr.

After storage at room temperature for 2 days, the products are heated for consumption and evaluated. The uncoated cubes are distinctly more fibrous in texture and less moist than the coated cubes and lack the consistency of the coated cubes. In addition, the sauce containing the uncoated cubes has thinned and is less viscous then the sauce containing the coated cubes.

Example VII

Codfish is cut into cubes of about 15 mm. One portion is stir-fried in an amount of cooking oil sufficient to prevent sticking and provides a yield of about 75% by weight. One portion is coated with a coating mixture having the composition of the mixture in EXAMPLE VI above and provides a yield of about 97% based upon the starting weight of the coated cubes.

Each of the stir-fried portions are packed with a lemon herb sauce and retorted as in EXAMPLE VI above.

Upon evaluation after reheating for consumption, the untreated fish cubes are, in comparison with the coated cubes, dry and fibrous. In addition, the sauce containing the untreated cubes is thinned out from moisture released from the cubes, whereas the sauce containing the treated cubes substantially retains its original viscosity.

Example VIII

A mixture of egg white powder, whey protein powder and corn starch in amounts of about 15.5%, 13.3% and 71.2%, respectively, by weight based upon the total weight of the mixture, is prepared. The mixture is mixed with water and corn oil in the percentages by weight as indicated below:

COATING	A	B	C
MIX	46.15	37.5	31.6
WATER	46.15	56.25	63.15
OIL	7.7	6.25	5.25

Blocks of frozen cod fish are coated by dipping separate blocks into separate mixtures. The coated blocks are held to allow fluid material to drip off the blocks and until drip of the coating material from the blocks has substantially ceased.

Weight comparison of the coated blocks indicates that blocks coated with COATING A retain about 6.8% coating by weight based upon the weight of the fish block. Blocks coated with COATING B retain about 4.2% coating by weight, and blocks coated with COATING C retain about 4% coating by weight.

Samples of each of coated blocks A, B and C are placed in sealed plastic pouches and frozen. After 2 days, the pouches containing the frozen cod are placed in boiling water to cook the fish.

After cooking, the pouches are compared visually. No fluid or drip is evident in the pouches containing coated blocks A. Visible drip is apparent in each of the pouches containing coated blocks B and C.

Samples of each of the cooked coated blocks A, B and C are placed in a lemon sauce in a container. After storage for 2 days, the products are evaluated. In comparison with the products containing cooked coated blocks A, sauces of the products containing cooked coated blocks B have thinned perceptibly, and the products containing cooked coated blocks C have thinned significantly. Sedimentation resultant from thinning of the sauce was C > B > A.

Example IX

Samples of coated blocks I of EXAMPLE VIII above, are cooked in a microwave oven. Only a slight amount of drip results, and the cooked fish has a light fluffy texture. The coating is not perceptible to the eye. In comparison, frozen blocks which are not treated in accordance with the present invention are cooked in the microwave oven under the same conditions. Significantly more amounts of fluid escape the fish during cooking, and the cooked fish has a dry and fibrous texture.

As is clear from the foregoing, various modifications of the present invention may be without departure from the spirit and scope of the disclosure, and the invention may be practiced suitably in the absence of elements not specifically disclosed herein.

Claims

1. A process for treating a food comprising preparing a mixture of egg albumen, milk protein, an unmodified starch and water ingredients and coating the mixture on an exterior surface of a food to obtain a coated food, wherein by weight, the egg albumen is in an amount of at least about 5%, the milk protein is in an amount of at least about 5%, the unmodified starch is in an amount of at least about 25% and the water is in an amount of at least about 40%, each weight being based upon the weight of the mixture.

2. A process according to claim 1 wherein the mixture further includes at least one ingredient selected from the group of ingredients consisting of an edible oil and salt.

3. A process according to claim 2 wherein the oil is in an amount up to about 7% by weight and the salt is in an amount up to about 7% by weight, each weight being based upon the weight of the mixture.

4. A process according to claim 1 or 2 wherein the mixture further includes a modified starch in an amount of not more than about 6% by weight based upon the weight of the mixture.

5. A process according to claim 1 wherein the unmodified starch is in an amount of at least about 30% by weight.

6. A process according to claim 1 wherein, by weight, the egg albumen is in an amount of from about 6% to about 12%, the milk protein is in an amount of from about 6% to about 19%, and the unmodified starch is in an amount of from about 30% to about 55% and the water is in an amount of from about 45% to about 50%.

7. A process according to claim 6 wherein the mixture further includes at least one ingredient selected from the group of ingredients consisting of an edible oil in an amount up to about 7% by weight, salt in an amount up to about 7% by weight and modified starch in an amount up to about 3% by weight, each weight being based upon the weight of the mixture.

8. A process according to claim 1 or 5 or 6 wherein the food is pieces of whole meat.

9. A process according to claim 1 further comprising heating the coating of the coated food to at least a temperature sufficient and for a time sufficient to, at least partially, coagulate the egg albumen, denature the milk protein and gelatinize the unmodified starch to obtain a heat-treated coated food product.

10. A process according to claim 1 wherein the coated food is heated to a temperature sufficient and for a time sufficient to cook the food at least partially and to coagulate the egg albumen, denature the milk protein and gelatinize the starch to obtain an at least partially cooked coated food product.

11. A process according to claim 9 further comprising combining the heat-treated coated food product with a sauce and retorting the heat-treated food product and sauce.

12. A process according to claim 10 further comprising combining the at least partially cooked coated food product with a sauce and retorting the food product and sauce.

13. A process according to claim 9 further comprising vacuum packing the coated food product to obtain a packed food product and heating the packed food product at a temperature for time sufficient so that the heat-treated food product is microbiologically stable.

14. A product of the process of claim 1.

15. A product of the process of claim 9.

16. A product of the process of claim 10.

17. A product of the process of claim 11.

18. A product of the process of claim 12.

19. A product of the process of claim 13.

20. A food product comprising a food having an exterior surface coated with a mixture of egg albumen, milk protein, an unmodified starch and water ingredients wherein the mixture contains, by weight, the egg albumen is in an amount of at least about 5%, the milk protein is in an amount of at least about 5%, the unmodified starch is in an amount of at least about 25% and the water is in an amount of at least about 40%, each weight being based upon the weight of the mixture.

21. A food product according to claim 20 wherein the starch is in an amount of at least about 30% by weight.

22. A food product according to claim 20 wherein the mixture further includes at least one ingredient selected from the group of ingredients consisting of an edible oil in an amount up to about 7% by weight, salt in an amount up to about 7% by weight and modified starch in an amount up to about 6% by weight, each weight being based upon the weight of the mixture.

23. A food product according to claim 20 wherein, by weight, the egg albumen is in an amount of from about 6% to about 12%, the milk protein is in an amount of from about 6% to about 19%, and the unmodified starch is in an amount of from about 30% to about 55% and the water is in an amount of from about 45% to about 50%.

24. A food product comprising a whole meat piece coated with a mixture of coagulated egg albumen, denatured milk protein and gelatinized starch.

25. A food product according to claim 24 wherein the meat is at least partially cooked meat.

26. A food product according to claim 25 wherein the coated meat is contained in a sauce.

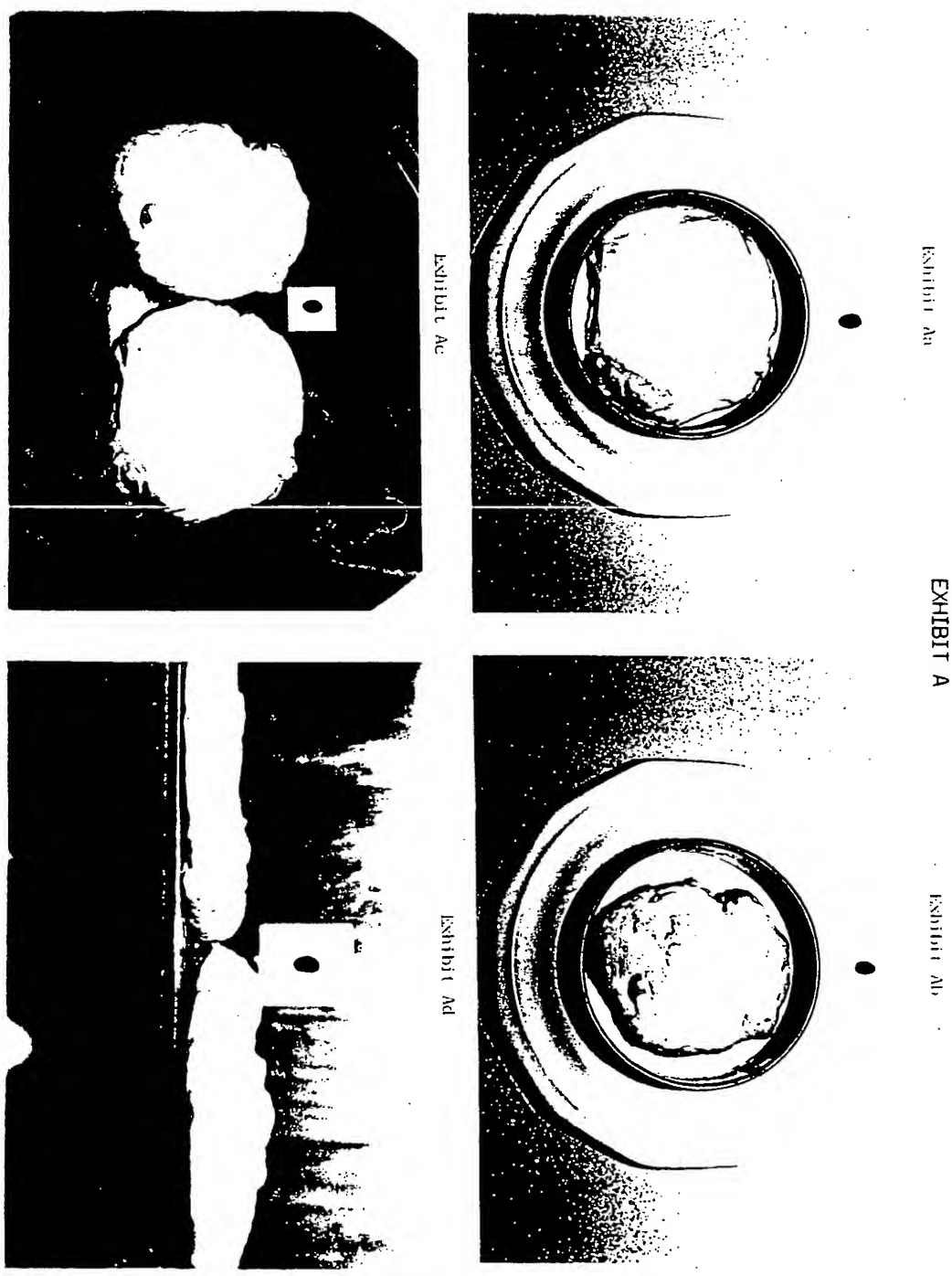

EXHIBIT A

Exhibit Aa

Exhibit Ab

Exhibit Ac

Exhibit Ad

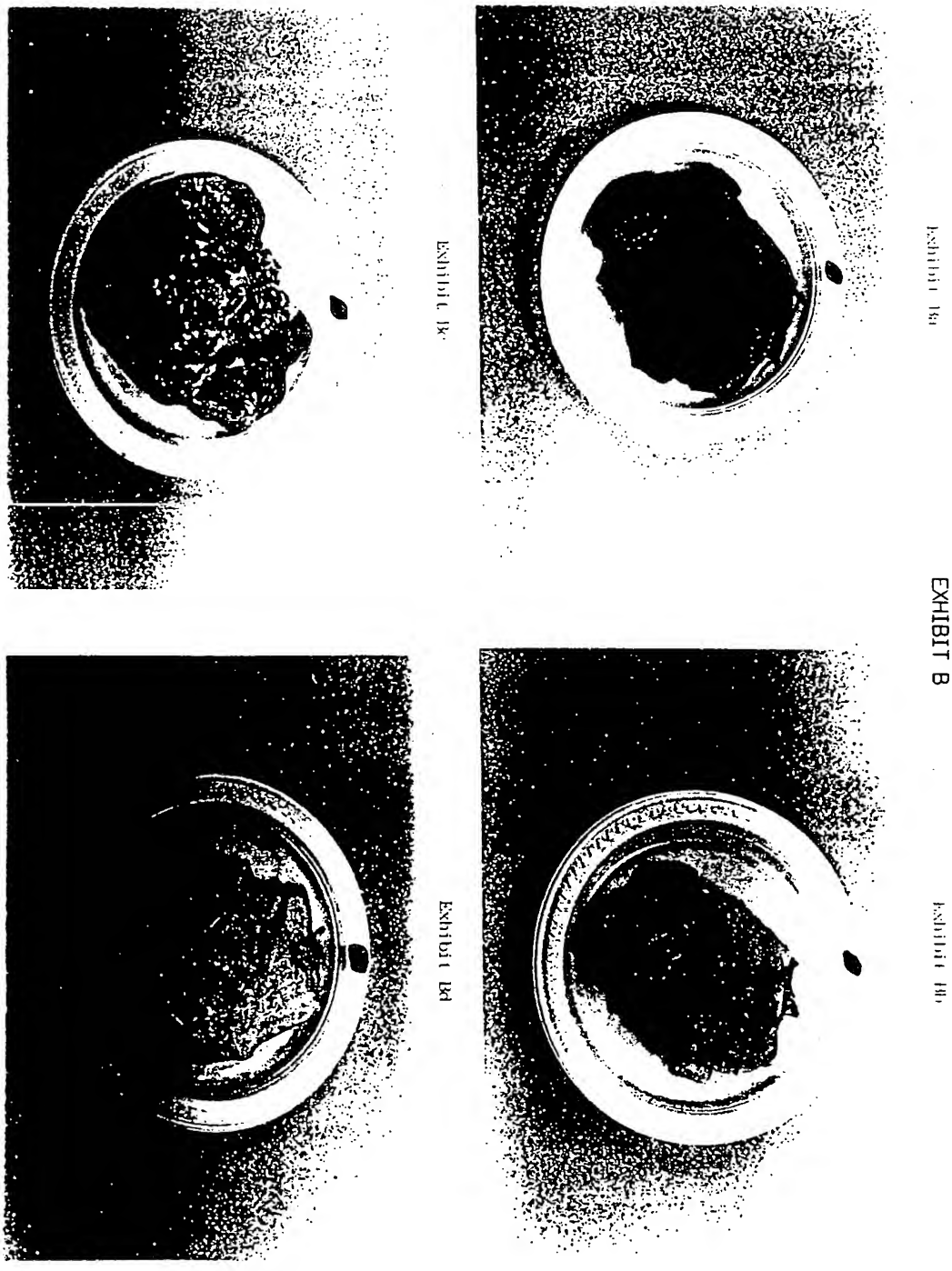

EXHIBIT B

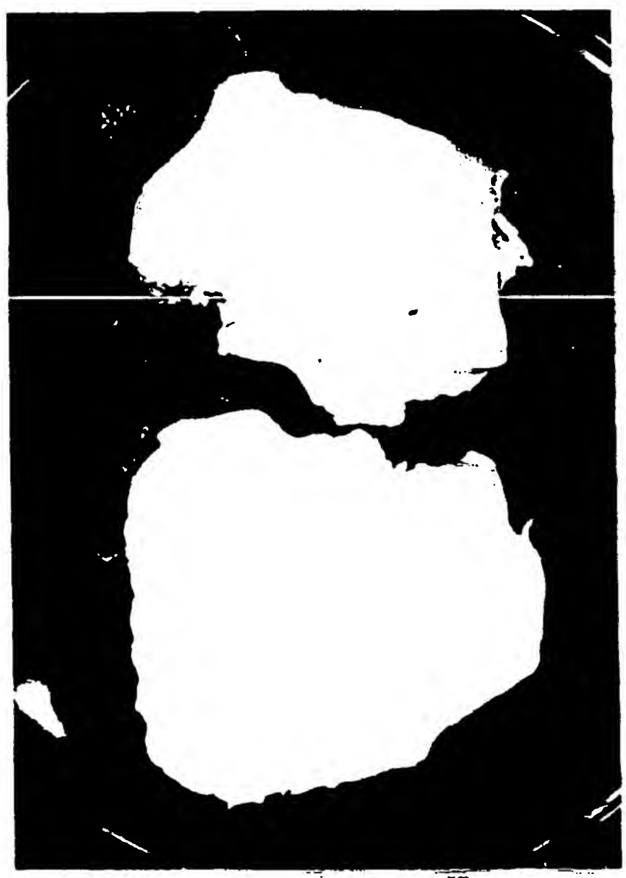

Exhibit Be

EXHIBIT B (Cont inued)

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(54) **Food fluid retention system.**

(57) Foods are coated with a mixture of egg albumen, a milk protein, an unmodified starch and water to provide a system for retaining fluids in the foods, particularly those foods which are heated to cook them. To effect fluid retention in the foods, at least the coating is heated to a temperature sufficient for a time sufficient to coagulate the egg albumen, denature the protein and gelatinize the starch of the coating, at least partially, and the coated foods may be heated to cook them at least partially, thereby coagulating the egg albumen, denaturing the milk protein and gelatinizing the starch of the coating.

EP 0 576 726 A3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 92 11 9541

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X Y Y	GB-A-1 092 026 (DCA FOOD INDUSTRIES) * page 2, line 39 - line 64 * ---	1,4-10, 14-16, 20-25 11,12, 17,18,26 13,19	A23P1/08 A23L1/31 A23L1/48
X	US-A-2 623 825 (D.K.TRESSLER) * the whole document * ---	1-3, 8-10, 14-16, 20,21, 23-25	
X	US-A-3 169 069 (H.L.HANSON) * column 3, line 5 - line 73 * ---	1,5,6, 8-10, 14-16, 20,21, 23-25	
X	S.L.KOMARIK : 'Food Products Formulary - Volume.1' 1974 , AVI , WESTPORT - USA Pages 290-291 * page 291, paragraph 1 * ---	1-3,5,6, 8-10, 14-16, 20,21, 23-25	TECHNICAL FIELDS SEARCHED (Int.Cl.5) A23P A23L
X,D	EP-A-0 393 361 (SOCIETE DES PRODUITS NESTLE) * the whole document * ---	14-16,24	
Y	US-A-2 366 169 (A.BARTH) * claim 5 * --- -/--	11,12, 17,18,26	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 June 1994	Vuillamy, V

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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D : document cited in the application
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EPO FORM 1503 03.82 (P04C01)

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EUROPEAN SEARCH REPORT

Application Number
EP 92 11 9541

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
Y	DE-A-19 04 871 (RENE FOODS INC.) * claim 1 * * page 2, paragraph 4 - page 3, paragraph 2 * * page 9, paragraph 3 - page 11, line 2 *	13,19	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13 June 1994	Vuillamy, V

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L : document cited for other reasons

& : member of the same patent family, corresponding document

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(54) A needle for the injection of brine into meat pieces

(57) It comprises a tubular body (1) provided with an axial duct (2) with radial holes (3) being distributed along the tubular body of the needle and piercing its wall right through, having a diameter which is apt to assure the spraying of the brine under pressure. A holding end portion (4) is connected to an end of the body (1) and provided with a fastening zone (5), and a pointed tip (6) is connected to the other end of said body (1). An upper wall of the tip (6) connected to the lower end of the axial duct (2), comprises a plane (7) in the shape of an inclined trough or bowl whose profile shows a width which decreases from top to bottom, in such a way that its lower profile or bottom ends in a flushing connection with the lower part of the inner wall of the radial hole (3) which is closest to the needle pointed tip (6).

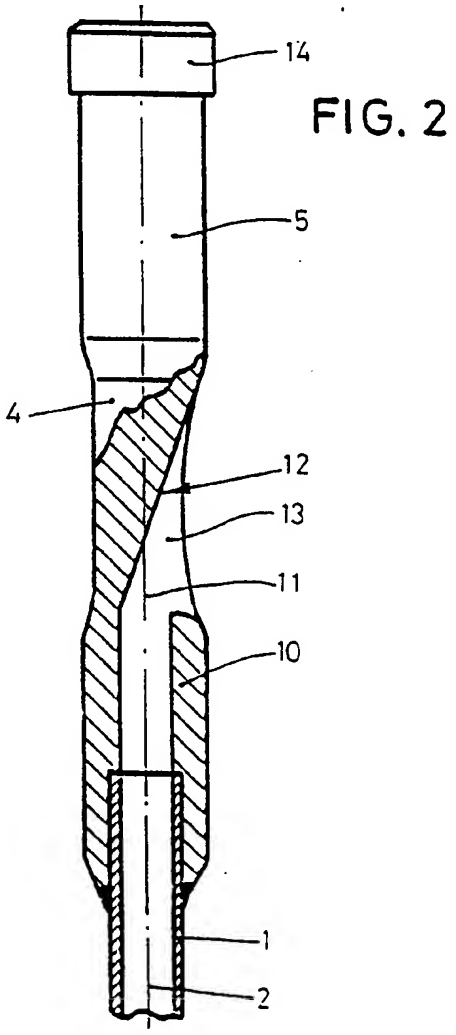

FIG. 2

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Description

The invention concerns a needle for the spray injection into meat pieces of brine obtained from a series of additives and/or ingredients which are indispensable for the process of curing the meat pieces, generally baked ham or shoulder meat, in order to assure the colouring and the flavour, of the type comprising a tubular body provided with an axial duct with radial holes having a diameter which is apt to assure the spraying under pressure, said holes being distributed along the tubular body of the needle and piercing its wall right through, a holding end portion connected to an end of said tubular body and provided with a fastening/gripping zone, and a pointed tip connected to the other end of said tubular body.

As publications of prior art can be cited patents SU-A-1 629 017, FR 2 470 545, CH-A-541 930, AU-D-3 894 772, FR-A-2 366 797, DE-A-19 13 072 and US 4 690 046.

The known needles of this kind are of two types depending on the existing operating procedures (mode of injecting the brine into the meat):

a) the low-pressure process (with pressures of the order of 4 kg/cm^2) which uses needles having in general 2 or 4 orthogonal radial holes with a diameter of the order of more than one millimetre, said needles depositing the brine during the passage of the needle through the meat, thereby forming brine deposits which must be thereafter spread by mechanical action. With this process the use of higher pressures would damage the structure of the meat, since the jet would cause the separation and even the rupturing of the meat fibres;

b) the high-pressure process (with pressures of the order of 8 to 12 kg/cm^2), more effective, which uses needles with a bigger number of radial holes, in general from 11 to 14, distributed at different heights along the needle body, said holes having a smaller diameter, generally of the order of some 0.6 mm, the brine being spray injected under pressure once the needles have been arrested in position once having been driven into the meat piece. Thus once the needles have been driven into the meat piece and have been arrested at the end of their travel the brine is then injected into the meat with a "spray" or "nebulizator" effect, thereby introducing into the mass of meat a volumetrically dosed quantity of brine which is distributed in a very homogeneous way throughout the whole meat piece.

In both solutions the brine excess is recycled thus causing, because of the meat microfibres it contains, the clogging of the holes, and mainly of the last one at the lowest part in the vicinity of the needle tip (an important part of the meat piece hence not receiving any sprayed brine), this complicating the regular needle cleaning tasks which are mandatory. This phenomenon is all the more important (difficulty of the cleaning and clogging frequency) the smaller the needle holes are.

The clogging of the hole which is closest to the needle tip determines an accumulation of residual matter on it which is hardly eliminable when cleaning the needle, and this can cause on the long term the clogging of the other holes and determines besides a pressure increase at the remaining open holes of the needle, with the consequent irregularities in the brine distribution.

The invention seeks to provide needles, mainly for the above-mentioned pressure spray injection process, which minimize the clogging of the lowest hole and hence any clogging in general, and which therefore simplify the corresponding needle cleaning tasks thus providing a better performance (a more homogeneous injection) and a reduction of the downtimes (economy).

In this way it becomes possible to obtain the full efficiency of the pressure spray injection process, which allows:

- a more homogeneous distribution of the brine, thus allowing the latter to penetrate the muscle fibres in form of microdrops without damaging them, avoiding the brine deposits between fibres;
- a higher accuracy of the injected brine percentage;
- a better cleaning of the needles (with the new needles).

For such a purpose the invention provides needles in which:

- the bottom of the axial duct, which is constituted by the upper wall of the pointed tip connected to the lower end of said axial duct, comprises a plane in the shape of an inclined trough whose profile shows a width which decreases from top to bottom, in such a way that its bottom ends in a flushing connection with the lowest part of the inner wall of the radial hole which is closest to the needle tip;
- each cylindrically shaped radial hole comprises a bellmouthed section its mouth leading to the outside of the cylindrical body, said section being of a shorter length with respect to that of the corresponding cylindrical part.

The characteristics and advantages of the invention will become more apparent when reading the following detailed description of a preferred embodiment of the invention given by way of a nonlimiting example and shown in the enclosed drawings, wherein:

- figure 1 is an outside view of the needle;
- figure 2 is a part-sectional elevation of the connec-

tion of the holding end portion with the needle;

- figure 3 is an enlarged sectional detail of a radial hole;

- figure 4 is an enlarged sectional detail of the connection of the pointed tip with the needle;

- figure 5 is a detail view sectioned along section line V-V in figure 4.

The needle shown in the drawings comprises a tubular body (1) provided with an axial duct (2) and radial holes (3) having a diameter which is apt to assure the spraying under pressure, said holes being distributed at different heights along the wall of the needle body and piercing said wall right through, a holding end portion (4) connected to an end of said tubular body (1) and provided with a fastening zone (5), and a pointed tip (6) connected to the other end of said tubular body.

The bottom of the axial duct (2), which is constituted by the upper wall of the tip (6) connected to the lower end of said axial duct, comprises a plane (7) in the shape of an inclined trough or bowl whose profile shows a width which decreases from top to bottom, in such a way that its lower profile or bottom ends in a flushing connection with the lower part of the inner wall of the radial hole (3) which is closest to the needle tip, as can be clearly appreciated in figure 4.

Each radial hole (3) comprises a cylindrical section (9) ending in the inside of the axial duct (2) and being at its other end followed by a bellmouthed section (8) ending in the outside of said wall (1) and having a reduced axial length as compared with the axial extent of the cylindrical portion (9).

The tubular body (1) is associated to a holding end portion (4) by way of a tubular section (10) provided with a duct (11) situated such that it forms an extension of duct (2) and leading laterally to the outside of the holding end portion (4) thereby following a steplessly inclined profile (12) and ending in opening (13).

The holding end portion (4) comprises a differentiated cylindrical zone (14) which is apt to receive inscriptions relative to the nature of the needle used, and in particular a reference to its nonclogging quality, or to the simple cleaning of its holes, as per the previously described construction.

The lateral injection opening (13) is surrounded by a sleeve (not shown) comprising a lateral injection intake.

The needles are generally fixed on a head which carries a plurality of needles (multineedle head).

The lower hole (3) must be situated at the lowest possible level (closest to the end (6)) for the spraying to reach all parts of the meat piece. The homogeneous distribution of the brine conditions the resulting quality of the meat pieces. In effect, an irregular distribution will give rise to an excess or lack of brine entailing changes in the colour, flavour and consistency of the meat piece.

It is pointed out that the invention is not limited to the herein described and illustrated embodiment examples, for which other alternative executions can be contemplated, in particular as regards:

- the number and the peripheral distribution of the radial holes;

- the shape of the gripping and marking zone of the needle;

- the conception of the connection of the needle with the holding end portion;

without therefore issuing outside the scope of the invention.

Claims

1.- A needle for the spray injection into meat pieces of brine obtained from a series of additives and/or ingredients which are indispensable for the process of curing said meat pieces, in order to assure the colouring and the flavour thereof, of the type comprising:

- a tubular body (1) provided with an axial duct (2) with radial holes (3) being distributed along said tubular body (1) and piercing its wall right through, said holes (3) having a diameter which is apt to assure a spraying of the brine under pressure;

- a holding end portion (4) connected to a first end of said tubular body (1) and provided with a fastening zone (5), and

- a pointed tip (6) connected to a second end of said tubular body (1);

characterized in that a bottom of the axial duct (2), which is constituted by the upper wall of the tip (6) connected to the lower end of said axial duct (2), comprises a plane (7) in the shape of an inclined trough or bowl whose profile shows a width which decreases from top to bottom, in such a way that its lower profile or bottom ends in a flushing connection with the lower part of the inner wall of the radial hole (3) which is closest to said pointed tip (6).

2.- A needle, as per claim 1, characterized in that each radial hole (3) piercing the wall of the tubular body (1) comprises a cylindrical portion (9) ending in the inside of the axial duct (2) and being at its other end followed by a bellmouthed section (8) ending in the outside of said wall (1) and having a reduced

axial length as compared with the axial length of said cylindrical portion (9).

3.- A needle, as per claim 1, characterised in that the tubular body (1) is associated to said holding end portion (4) by way of a tubular portion (10) provided with a duct (11) situated such that it forms an extension of duct (2) and leading laterally to the outside of the holding end portion (4) thereby following a steplessly inclined profile (12) and ending in opening (13).

4.- A needle, as per claim 1, characterized in that the holding end portion (4) comprises a differentiated cylindrical zone (14) which is apt to receive inscriptions relative to the nature of the needle used.

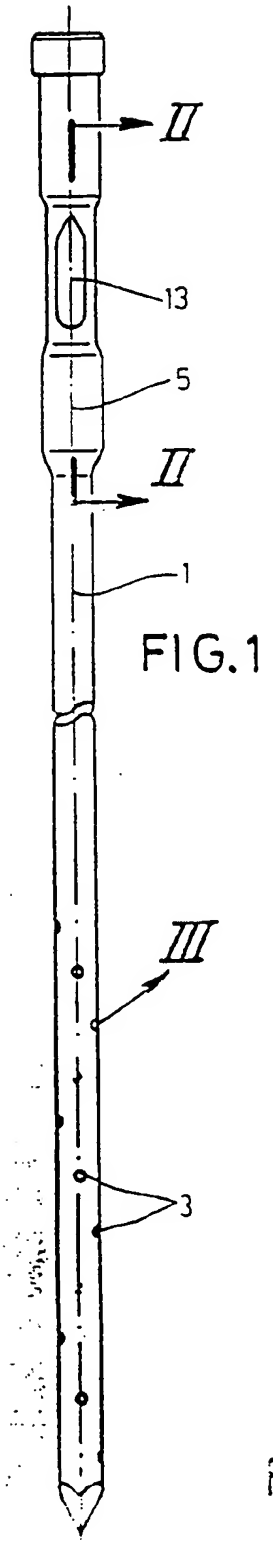


FIG. 1

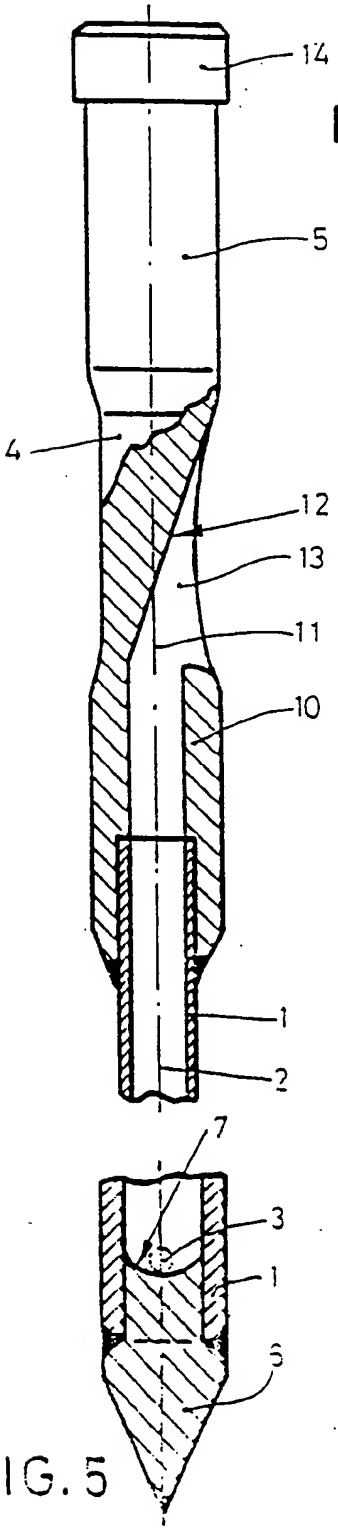


FIG. 2

FIG. 5

FIG. 3

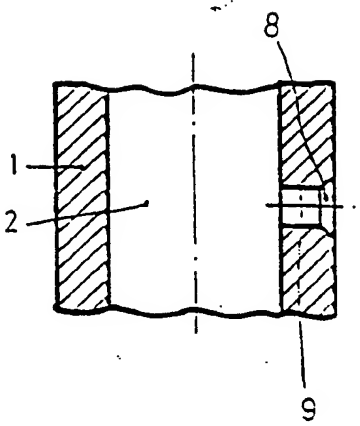
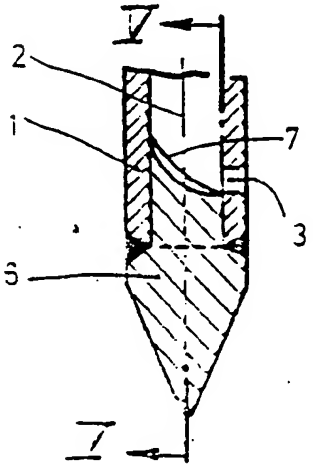


FIG. 4



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08010 Barcelona (ES)

(54) A needle for the injection of brine into meat pieces

(57) It comprises a tubular body (1) provided with an axial duct (2) with radial holes (3) being distributed along the tubular body of the needle and piercing its wall right through, having a diameter which is apt to assure the spraying of the brine under pressure. A holding end portion (4) is connected to an end of the body (1) and provided with a fastening zone (5), and a pointed tip (6) is connected to the other end of said body (1). An upper wall of the tip (6) connected to the lower end of the axial duct (2), comprises a plane (7) in the shape of an inclined trough or bowl whose profile shows a width which decreases from top to bottom, in such a way that its lower profile or bottom ends in a flushing connection with the lower part of the inner wall of the radial hole (3) which is closest to the needle pointed tip (6).

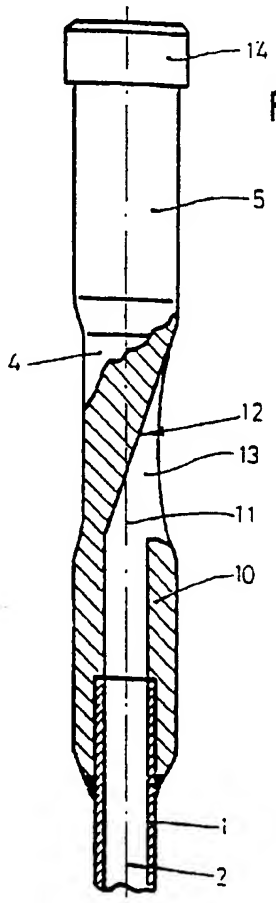

FIG. 2

EP 0 704 160 A3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 50 0114

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	US 3 530 785 A (M. J. PETERS ET AL.) * the whole document *	1,4	A23B4/28
Y	US 4 864 922 A (T. HIGASHIMOTO) * the whole document *	1,4	
A	US 2 544 316 A (V. W. HIGGINS) * column 1, line 24 - line 38; figures 1,3,4 *	2,4	
P,X	FR 2 708 177 A (METALQUIMIA) 3 February 1995 * the whole document *	1-4	
A	US 2 796 017 A (C. O. SCHMIDT) * the whole document *	1	
A	GB 2 181 035 A (J. ABAY) * page 1, line 128 - page 2, line 96; claims 1,7,8; figures 3,4 *	1	
A	GB 1 129 689 A (ARMOUR & COMP.) * the whole document *	1	TECHNICAL FIELDS SEARCHED (Int.Cl.6) A23B
A	US 1 425 143 A (G. SCHEIB) * the whole document *	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	27 March 1998	Guyon, R

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

RÉPUBLIQUE FRANÇAISE

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A1

DEMANDE DE BREVET D'INVENTION

(21) **N° 81 07053**

(54) **Procédé pour augmenter la teneur en macromolécules d'une saumure, saumure ainsi obtenue, équipement et installation pour la mise en œuvre du procédé.**

(51) Classification internationale (Int. Cl. ³). **A 23 B 4/02; A 23 J 1/02, 3/00; A 23 L 1/31.**

(22) Date de dépôt..... 8 avril 1981.
(33) (32) (31) Priorité revendiquée :

(41) Date de la mise à la disposition du public de la demande..... B.O.P.I. — « Listes » n° 41 du 15-10-1982.

(71) Déposant : ELECTRICITE DE FRANCE, Service National et WILLIAM SAURIN, résidant en France.

(72) Invention de : Daniel Chevrier et Michel Ayroulet.

(73) Titulaire : *Idem* (71)

(74) Mandataire : Cabinet Regimbeau, Corre, Martin et Schrimpf,
26, av. Kléber, 75116 Paris.

BNSDOCID: <FR_____2503540A1_I_>

La présente invention concerne les saumures de traitement de produits, notamment les saumures de traitement de produits carnés, telles que les saumures de charcuterie-salaisonnerie.

Elle vise plus particulièrement à valoriser ces saumures de manière à augmenter leur teneur en macromolécules et spécialement en protéines.

Dans l'art antérieur, en matière de produits carnés, des travaux ont déjà été effectués sur le sang pour valoriser ce sous-produit, cf. Industries agricoles et alimentaires, 96 (9-10) pages 951-956.

On sait que la salaison des poitrines, par exemple des poitrines de porc, utilisées en charcuterie, s'effectue, conformément à une technique essentiellement européenne, par immersion en saumure.

On réalise la salaison de poitrine fraîche et désossée par immersion dans de la saumure à 15-25° Baumé, ce qui permet de conférer à la poitrine les propriétés psychosensorielles caractéristiques d'une salaison grâce auxagents de salage qui pénètrent au coeur même du produit. Traditionnellement, les poitrines séjournent quatre ou cinq jours dans les saumures qui sont utilisées pour plusieurs opérations, par exemple cinq ou six opération puis rejetées à partir d'un certain niveau de contamination bactériologique. Après séjour dans la saumure, les poitrines sont égouttées, séchées, et éventuellement fumées. Les poitrines ainsi obtenues sont ensuite coupées en dés pour constituer des garnitures entrant dans la composition de plats cuisinés.

La saumure obtenue après un cycle de saumurage contient les poitrines dans un rapport pondéral saumure/ poitrines d'environ 1/1 et a une teneur en protéines d'environ 0,80 % en poids et une teneur en chlorure de sodium d'environ 15 % en poids.

La présente invention permet de valoriser une telle saumure de manière à augmenter sa teneur en macromolécules, par exemple en protéines, et à diminuer en

même temps sa teneur en chlorure de sodium.

Pour cela, la présente invention propose un procédé pour augmenter la teneur en macromolécules d'une saumure, notamment la teneur en protéines d'une saumure ayant servi au traitement de produits carnés, telle qu'une saumure de charcuterie-salaisonnerie, qui comporte les étapes suivantes consistant à :

- diluer la saumure avec de l'eau ;
- soumettre la saumure diluée obtenue à une ultra-filtration ;
- récupérer un concentrat à teneur accrue en macromolécules, notamment en protéines ; et
- récupérer un perméat stérile appauvri en macromolécules pouvant servir à la fabrication d'une nouvelle saumure.

Un autre avantage du procédé de l'invention est qu'il permet d'obtenir un perméat stérile et par conséquent de diminuer la charge polluante de l'effluent par comparaison au procédé traditionnel dans lequel l'effluent présente un certain niveau de contamination bactériologique. Par ailleurs, dans le cas où le perméat est réutilisé comme nouvelle saumure, le procédé de l'invention permet en outre de diminuer la quantité d'effluent rejeté.

La dilution de la saumure de départ permet d'atténuer les phénomènes osmotiques dus à la forte teneur en chlorure de sodium du produit de départ. Le taux de dilution est déterminé par la teneur en chlorure de sodium de la saumure de départ et est généralement compris entre environ 1 et 3, de préférence égal à environ 2.

Il est préférable de soumettre au préalable la saumure à une préfiltration de manière à retenir les matières en suspension dans celle-ci. A titre d'exemple, on peut utiliser un filtre ayant une ouverture de mailles

de 30 microns environ.

On effectue l'ultra-filtration sur une membrane d'ultra-filtration ayant par conséquent la propriété d'effectuer une séparation en fonction des poids moléculaires. On rappellera que le seuil de coupure est une caractéristique d'une membrane d'ultra-filtration et représente le poids moléculaire au-delà duquel toutes les molécules sont retenues par celle-ci à 100 %. Dans le cas présent, on pourra utiliser une membrane à perméabilité sélective dont le seuil de coupure sera compris entre environ 2000 et 50 000.

Le procédé de l'invention prévoit également de nettoyer périodiquement la membrane d'ultra-filtration par passage d'un fluide à contre-courant.

L'invention concerne aussi les saumures à teneur accrue en macromolécules, notamment en protéines, obtenues par la mise en oeuvre du procédé.

Les saumures ainsi obtenues pourront avoir, par exemple, une teneur en protéines de l'ordre de 2,5 à 3 % en poids et une teneur en chlorure de sodium inférieure à 10 % en poids. Ces saumures présentent des aptitudes fonctionnelles (aptitudes de liaison et d'émulsification) comparables à celles du plasma sanguin.

En effet, leur constante de liaison ("bind value" selon la méthode de SAFFLE) est de 3,46 à 3,75, alors que celle du plasma sanguin est de 3,5.

L'invention concerne également un équipement pour la mise en oeuvre du procédé ci-dessus, cet équipement comportant :

- au moins un bac destiné à contenir la saumure ;
- deux pompes volumétriques aptes à alimenter le bac respectivement en saumure et en eau en propor-

tion déterminée,

- un module d'ultra-filtration contenant au moins une membrane d'ultra-filtration,

- une pompe haute pression apte à alimenter le module d'ultra-filtration en saumure diluée à partir du bac,

- une canalisation pour recueillir le concentrat enrichi en macromolécules retenu dans le module d'ultra-filtration, et

une canalisation pour recueillir le perméat appauvri en macromolécules.

Cet équipement comportera avantageusement un filtre disposé en amont de la pompe d'alimentation en saumure pour retenir les matières en suspension qu'elle contient.

L'équipement comporte également avantageusement un circuit de nettoyage associé au module d'ultra-filtration pour nettoyer la membrane par passage d'un fluide à contre-courant.

L'équipement comporte également avantageusement un dispositif de régulation de la température de la saumure diluée.

Enfin, la présente invention concerne également une installation de traitement de produits au moyen d'une saumure, notamment pour le traitement de produits carnés au moyen d'une saumure telle qu'une saumure de charcuterie-salaisonnerie, qui est munie d'un équipement tel que décrit précédemment.

D'autres caractéristiques et avantages de l'invention seront mieux compris à la lecture de la description détaillée qui va suivre et qui se réfère au dessin annexé, donné uniquement à titre illustratif et sur lequel :

. la figure unique représente un schéma de principe d'un équipement conforme à la présente invention.

Sur la figure annexée, on a représenté un bac 10 destiné à contenir une saumure alimentée par une canalisation 12. Le fond du bac 10 débouche sur une canalisation 14 alimentant un préfiltre 16 destiné à éliminer les matières en suspension contenues dans la saumure. Ce préfiltre pourra avoir par exemple une ouverture de mailles de 30 microns et sera nettoyé de préférence après le début de chaque opération.

Le préfiltre 16 débouche par l'intermédiaire d'une canalisation 18 sur une pompe volumétrique 20 qui est elle-même reliée par une canalisation 22, en un point 24 à une canalisation 26.

Cette canalisation 26 est alimentée en eau de dilution par l'intermédiaire d'une canalisation 28 aboutissant à une autre pompe volumétrique 30 reliée au point 24 par une canalisation 32.

En règlant convenablement les pompes 20 et 30 on peut modifier à volonté la dilution de la saumure circulant dans la canalisation 26. Cette canalisation 26 est reliée à une pompe haute pression 34 qui alimente, par l'intermédiaire d'une canalisation 36 un module d'ultra-filtration représenté schématiquement en 38. Ce module est équipé d'une membrane d'ultra-filtration 40 ayant un seuil de coupure déterminé, par exemple compris entre 2000 et 50 000 en fonction des résultats souhaités. Bien entendu, il est possible au lieu d'utiliser un seul module d'ultra-filtration, d'utiliser plusieurs modules disposés en série.

Le module d'ultra-filtration 38 est relié à une canalisation 42 pour recueillir un concentrat enrichi en macromolécules retenues dans le module d'ultra-filtration.

Le module d'ultra-filtration 38 est également relié à une canalisation 44 pour recueillir le perméat

appauvri en macromolécules, par exemple en protéines. Le perméat obtenu peut être rejeté à l'égout par une canalisation 46 ou bien peut servir à la fabrication d'une nouvelle saumure et est retourné par une canalisation 48 vers la canalisation 12 d'alimentation en saumure.

Le module d'ultra-filtration 38 comporte un circuit de nettoyage permettant de faire passer un fluide à contre-courant ou à co-courant dans le compartiment concentrat relatif à la membrane 40. Ce circuit de nettoyage comporte un bac 50 destiné à contenir le fluide de nettoyage, une canalisation 52 débouchant sur le module 38 et une canalisation 54 de retour prévue entre le module 38 et le bac 50.

A titre d'exemple, le nettoyage du module d'ultra-filtration peut être effectué par rinçage à l'eau industrielle (30° TH) pendant 30 minutes, par passage d'un produit du genre Tergazyme 1 % à 20°C pendant 30minutes et rinçage à l'eau pendant 45 minutes. On pourrait également prévoir un lavage acide.

L'équipement représenté sur la figure comportera également avantageusement un dispositif de réfrigération associé au bac 10. Ce dispositif devra être plongé directement dans le bac ou être relié à celui-ci de manière à fournir la température désirée. En effet, la température de fonctionnement dépend avant tout de la thermosensibilité des macromolécules à récupérer et doit être suffisamment basse pour empêcher les développements bactériologiques. Dans le cas du traitement de saumure de charcuterie-salaisonnerie, la température de fonctionnement doit être d'environ 10°C.

Comme indiqué plus haut, la teneur en chlorure de sodium de la saumure est critique étant donné qu'elle détermine le taux de dilution qui sera déterminé par le réglage des pompes volumétriques 20 et 30. La pression d'utilisation du module d'ultra-filtration 38 est

déterminée essentiellement par le seuil de coupure de la membrane et par la teneur en chlorure de sodium du produit d'alimentation du module d'ultra-filtration. La vitesse de circulation est critique, elle est fonction de la perte de charge du module, donc de sa géométrie, et des caractéristiques du produit.

On donnera ci-après à titre d'exemple, les résultats d'essai obtenus sur une saumure traitée avec l'équipement décrit ci-dessus.

On utilise une saumure de charcuterie-salaisonnerie obtenue après un cycle (une semaine) de fabrication. Cette saumure contient environ 0,74 % en poids de protéines et 14,8 % en poids de chlorure de sodium.

On dilue au départ la saumure avec un taux de dilution de 2 en ajoutant une quantité égale d'eau à celle de la quantité de saumure. Après cette dilution, le pourcentage de protéines est de 0,37 et celui de chlorure de sodium est de 7,4. Au bout de 48 heures d'ultra-filtration, le concentrat obtenu a une teneur en protéines de 2,78 % en poids et une teneur en chlorure de sodium de 9,5 % en poids. Le perméat moyen recueilli a une teneur en protéines de 0,29 % en poids et une teneur en chlorure de sodium de poids.

Le pourcentage en protéines se trouve ainsi multiplié par un facteur d'environ 3,75 par rapport à la saumure de départ. Le produit obtenu qui présente un pourcentage en protéines de 2,78 % et un pourcentage en chlorure de sodium de 9,5 % présente des aptitudes fonctionnelles (aptitudes de liaison et d'émulsification) comparables à celles du plasma sanguin.

Les résultats ci-dessus ont été obtenus avec une membrane d'ultra-filtration de caractéristiques suivantes:

- membrane type PCI,
- Référence T 2/A,
- Seuil de coupure de 2000 (exprimé en poids moléculaire), et dans les conditions de fonctionnement

suivantes :

- vitesse de circulation 2,5 m/s,
- pression moyenne dans le module 17 bars,
- température 10°C.

L'invention permet ainsi d'obtenir un concentrat ayant une teneur en protéines d'au moins 2 % et une teneur en chlorure de sodium voisine de 8 %, ce concentré étant ainsi facilement incorporable dans les formules de produits carnés émulsionnés, au même titre que le plasma sanguin ou éventuellement en remplacement partiel de celui-ci.

On rappellera à ce propos que le terme "formule" définit, dans le domaine de la salaisonnerie, le complément protéique indispensable à la standardisation de produits,tels que les saucisses et saucissons, fabriqués à partir des matières premières (graisses et viandes).

Il est possible éventuellement de réutiliser le concentrat en le soumettant à une nouvelle ultra-filtration. Cette solution offre notamment l'avantage, déjà indiqué plus haut, de diminuer la quantité d'effluent rejeté.

Bien entendu, l'invention peut être appliquée à tous types de saumures utilisés dans le traitement de produits et spécialement dans le traitement de produits carnés.

REVENDICATIONS

1. Procédé pour augmenter la teneur en macromolécules d'une saumure, notamment la teneur en protéines d'une saumure ayant servi au traitement de produits carnés, telle qu'une saumure de charcuterie-salaisonnerie, caractérisé par le fait qu'il comporte les étapes suivantes consistant à :

- diluer la saumure avec de l'eau ;
- soumettre la saumure diluée obtenue à une ultra-filtration ;
- récupérer un concentrat à teneur accrue en macromolécules, notamment en protéines ; et
- récupérer un perméat stérile appauvri en macromolécules, pouvant servir à la fabrication d'une nouvelle saumure.

2. Procédé selon la revendication 1, caractérisé par le fait que l'on dilue la saumure avec un taux de dilution compris entre environ 1 et 3.

3. Procédé selon la revendication 1, caractérisé par le fait qu'il comporte l'étape préalable consistant à préfiltrer la saumure pour retenir les matières en suspension dans celle-ci.

4. Procédé selon la revendication 1, caractérisé par le fait que l'on effectue l'ultra-filtration au moyen d'au moins une membrane à perméabilité sélective dont le seuil de coupure est compris entre 2000 et 50 000.

5. Procédé selon la revendication 4, caractérisé par le fait que l'on nettoie périodiquement la membrane d'ultra-filtration par passage d'un fluide à contre-courant.

6. Saumure à teneur accrue en macromolécules, notamment en protéines, obtenue par la mise en oeuvre du procédé selon l'une des revendications 1 à 5, cette saumure ayant des propriétés comparables à celle du plasma sanguin et pouvant servir en charcuterie comme émulsifiant riche en protéines à haute valeur technologique.

7. Equipement pour la mise en oeuvre du procédé selon l'une des revendications 1 à 5, caractérisé par le fait qu'il comporte :

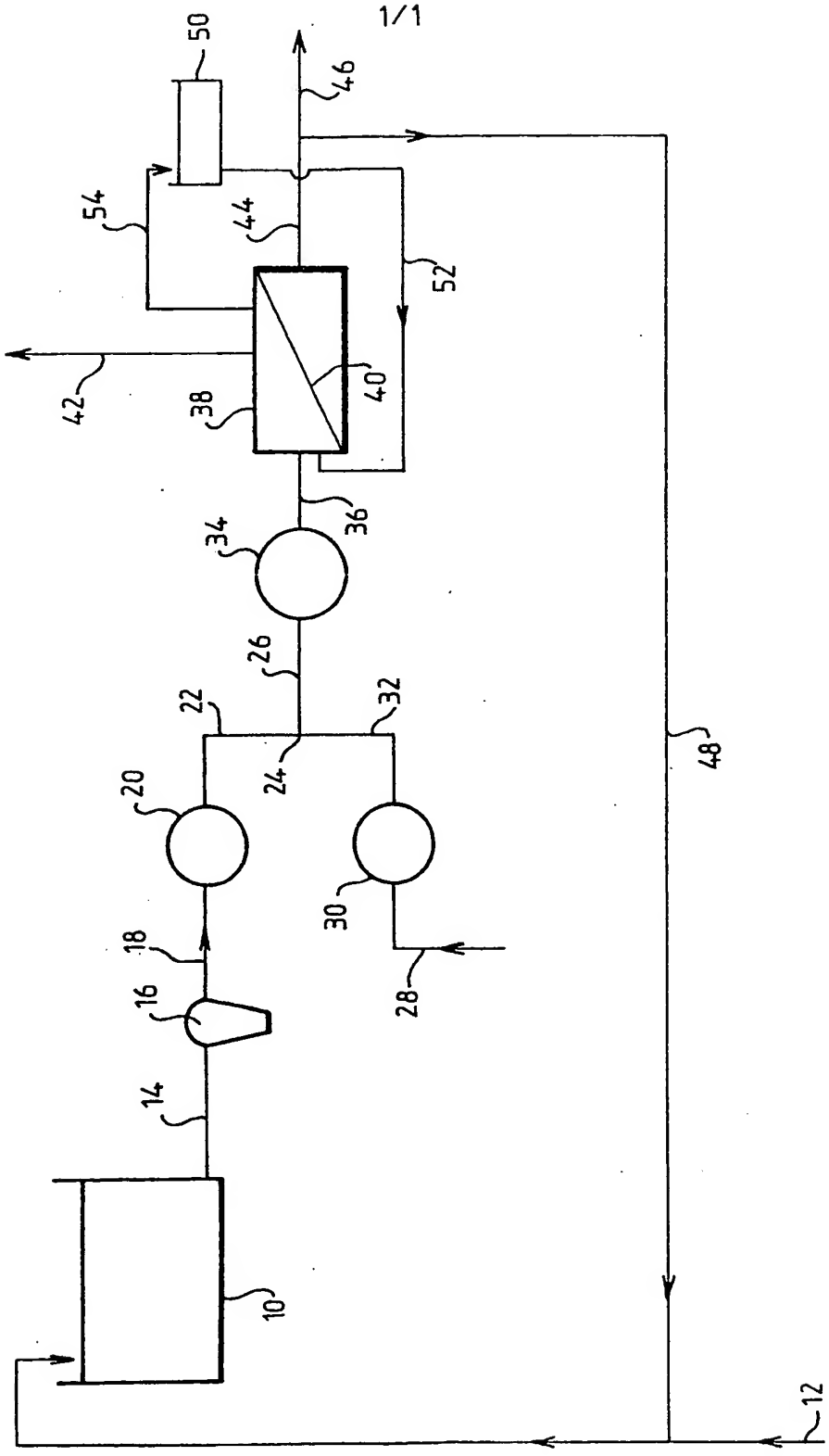
- au moins un bac (10) destiné à contenir la saumure ;
- deux pompes volumétriques (20,30) aptes à alimenter le bac (10) respectivement en saumure et en eau en proportion déterminée ;
- un module d'ultra-filtration (38) contenant au moins une membrane d'ultra-filtration (40) ;
- une pompe haute pression (34) apte à alimenter le module d'ultra-filtration (38) en saumure diluée à partir du bac (10);
- une canalisation (42) pour recueillir le concentrat enrichi en macromolécules retenu dans le module d'ultra-filtration (38) ;
- une canalisation (44) pour recueillir le perméat appauvri en macromolécules.

8. Equipement selon la revendication 7, caractérisé par le fait qu'il comporte un filtre (16) disposé en amont de la pompe (20) d'alimentation en saumure pour retenir les matières en suspension qu'elle contient.

9. Equipement selon l'une des revendications 7 et 8, caractérisé par le fait qu'il comporte un circuit de nettoyage (50,52,54) associé au module d'ultra-filtration (38) pour nettoyer la membrane (40) par passage d'un fluide à contre-courant.

10. Equipement selon la revendication 7, caractérisé par le fait qu'il comporte un dispositif de régulation de la température de la saumure diluée.

11. Installation de traitement de produits au moyen d'une saumure, notamment pour le traitement de produits carnés au moyen d'une saumure telle qu'une saumure de charcuterie-salaisonnerie, caractérisée par le fait qu'elle est munie d'un équipement selon l'une des revendications 7 à 10.



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(22) **Date de dépôt** : 20.07.90.

(30) **Priorité** :

(43) **Date de la mise à disposition du public de la demande** : 24.01.92 Bulletin 92/04.

(56) **Liste des documents cités dans le rapport de recherche** : *Se reporter à la fin du présent fascicule.*

(60) **Références à d'autres documents nationaux apparentés** :

(71) **Demandeur(s)** : *POUILLAUDE Pierre-Ernest* — FR et *POULIN Jacques* — FR.

(72) **Inventeur(s)** : Pouillaude Pierre-Ernest et Poulin Jacques chez Ste Salmon'Est France.

(73) **Titulaire(s)** :

(74) **Mandataire** :

(54) Procédé de préparation et de conservation de chair d'animaux aquatiques de mer et d'eau douce, produits obtenus par ce procédé, et application en l'état de ces produits à la consommation.

(57) Le procédé concerne les étapes suivantes:
- séparation de la chair des parties indésirables tels que peau, squelettes, arêtes, carapaces et/ou coquilles, et/ou viscères.
- les arêtes, carapaces, têtes, et tous déchets résultant de l'étape précédentes, sont broyés finement, mis à cuire et réduits au feu afin d'obtenir une gelée aromatisée et parfumée destinée à glacer le produit fini.
- traitement de la chair au sel dont le mode, les quantités et la durée sont fonction des déterminations des teneurs en lipides, humidité, ABVT, HPD et/ou HPDA. Il est également tenu compte du poids, de la taille, de l'épaisseur, des origines animales et/ou géographique de la chair.
lavage suivi d'un essuyage et/ou étuvage et/ou séchage.
- trempage dans une solution de traitement de conservation, d'aromatisation et de parfumage.
- lavage suivi d'un traitement de finition.
- glaçage à la gelée facultativement.
- conditionnement du produit ainsi traité.

FR 2 664 794 - A1

PROCEDE DE PREPARATION ET DE CONSERVATION DE CHAIR D'ANIMAUX AQUATIQUES DE MER ET D'EAU DOUCE, PRODUITS OBTENUS PAR CE PROCEDE, ET APPLICATION EN L'ETAT DE CES PRODUITS A LA CONSOMMATION.

L'invention concerne un procèdé de préparation et de conservation de chair d'animaux marins d'eau de mer et d'eau douce, frais, crus, permettant notamment de lui confèrer des qualités gustatives, l'aspect et la forme appropriés.

Le poisson est un aliment dont nul ne conteste les qualités hautement gustatives et diététiques. Pourtant, un grand nombre de consommateurs potentiels hésite à en profiter car le poisson souffre d'un certain nombre de préjugés défavorables. On lui reproche notamment la présence de ses arêtes qui, outre le déchet qu'elles constituent, risquent de créer des incidents lors de leur ingestion. On lui reproche aussi l'odeur qu'il dégage souvent lors de la cuisson et qui constitue une gêne pour l'environnement. Mais surtout, est c'est là l'essentiel, le poisson, lorsqu'on le prépare, doit être d'une fraîcheur irréprochable sous peine de créer des intoxiations. Les moyens modernes qui constituent les chaînes de froids et la congélation, permettent de prolonger la fraîcheur de cet aliment, mais le poisson ainsi traité perd le plus souvent de sa saveur et conduit aussi à un changement notable de sa texture.

La présente invention a pour but de pallier ces inconvénients et concerne un procèdé de préparation et de conservation qui permet au consommateur de déguster un poisson sans arêtes, conservant toute sa saveur sous une forme compacte permettant qu'il soit découpé à la demande et/ou prétranché, et/ou conditionné sous toutes formes, jusque et y compris haché et/ou en boyau et/ou en conserve et/ou en bloc compact ou non.

A ce jour, la conservation plus de 4 jours de poissons préparés prêts à être servis crus pour une dégustation en l'état est une utopie avec une réfrigération traditionnelle de particulier. C'est pourquoi la chair de poisson est généralement cuite ou consommée rapidement.

Les procèdés de conservation actuels sont connus. Ils requièrent une mise en oeuvre complexe et coûteuse et font souvent appel à des produits de synthèse. La législation exige que figurent sur l'emballage d'un produit consommable sa composition, ce qui oblige donc de préciser ces produits de synthèse. En dépit de leur inocuité relative, le seul fait du caractère ésotérique de leur nom et/ou de leur désignation inquiète le consommateur et/ou le fait fuir ou refuser l'achat.

Le résultat que l'invention vise à obtenir est un procèdé de traitement de chair d'animaux aquatiques de mer ou d'eau douce, destinée à une conservation à moyen terme et/ou à sa dégustation sous sa forme sans autre transfor-

mation obligatoire après emballage et déballage. Ce résultat est obtenu en employant uniquement des produits connus, qui n'altèrent pas les bons principes contenus dans la chair et permettent une ingestion de cette chair crue en transformant sa saveur pour la rendre très agréable voir délicieuse

LE PROCEDE SELON L'INVENTION COMPORTE SIX ETAPES.

Première étape :

La chair d'animal aquatique est séparée du squelette qui peut être indifféremment des arêtes pour les poissons et/ou des carapaces pour les crutacés et/ou des coquilles pour d'autres espèces. Ont peut, sans que celà constitue une règle, retirer la peau mais dans le cas où on la laisse, il est impératif d'écailler si cette peau présente des écailles.

Deuxième étape :

Traitement au sel dont le mode, les quantités, et la durée seront fonction des déterminations des teneurs en lipides, et/ou humidité, et/ou HPD, et/ou HPDA, et/ou ABVT ; éléments qui sont souvent variables, même au sein de la même espèce.

Il sera également tenu compte de la diversité des chairs traitées, tant par la taille, l'épaisseur, le poids, l'origine animale et/ou géographique.

Ce traitement au sel pourra varier de 1 miligramme à 500 grammes de sel par kilogramme de chair traitée avec ou sans adjonction de tous produits destinés à la consommation.

Le traitement au sel pourra varier de 1 minute à 40 jours. Le procèdé de prise de sel peut être manuel et/ou par trempage et/ou par injection et/ou par douchage et/ou par pulvérisation et/ou par tous autre moyen présent et à venir destiné à mettre en présence la chair et les principes actifs du sel.

Troisième étape :

Après le temps nécessaire de passage au sel il est indispensable de laver la chair pour la débarasser de son trop plein de sel. On doit ensuite pratiquer un essuyage et/ou un étuvage et/ou un séchage.

Quatrième étape :

La chair ainsi obtenue résultant des trois premières étapes est mise à tremper dans une marinade comprenant une base de trois éléments qui sont les éléments principaux pour la conservation.

1° - d'acides gras

2° - de vinaigres et leurs dérivés

3° - de lait et ses dérivés.

Les acides gras peuvent se présenter sous forme d'huile ou non, saturée ou insaturée.

Ces trois premiers composants sont les composants de base auxquels on ajoute 1 ou plusieurs des composant du 4°.

4° - Jus de fruits, fermentés, alcoolisés ou non. Tous types de vins et leur dérivés tels que : alcool, extrait, vin cuit, liqueurs, apéritifs, digestifs et de manière générale tout ce qui se rapporte au vin ou est à base de vin, champignons, et/ou céréales, et/ou légumes et leurs dérivés tels que jus, extraits, alcools, arômes, oeufs, fruits et sucre, et sucres.
En outre on peut ajouter différents aromates et/ou arômes et/ou condiments, et/ou parfums, et/ou colorants et additifs utilisés dans l'élaboration des différents parfums et saveurs incorporés dans ces produits et/ou dérivés destinés à diversifier les saveurs et les qualités gustatives en fonction de la nature de la chair traitée et/ou du goût à obtenir et/ou de l'aspect final.

Les carcasses, têtes, squelettes et carapaces, et certains déchets sans viscères pourront être broyées très finement, mouillés et réduits à feu doux, aromatisés en harmonie avec le résultat gustatif et olfactif de la phase 4 afin d'être gélifié.

Cette gelée est destinée à parer la chair après sa phase finale afin de lui donner meilleur aspect et, éventuellement d'en affiner le goût par contact.

Les marinades sont utilisées pour la confection du produit selon l'invention suivant des temps variables de 1 minutes à 40 jours selon des températures négatives pouvant atteindre soixante degré celsius en dessous de zéro ou positives pouvant aller jusqu'à ébullition et/ou vaporisation.
Cette variation dans le temps est dûe notamment à la nature de la chair traitée et/ou à l'épaisseur et/ou au poids et/ou à la puissance que l'on souhaite donner à l'imprégnation des saveurs de la marinade. La température de la marinade influe également sur le temps de trempage.
Les pourcentages des trois produits de base sont variables de 1 % à 90 % selon la saveur à obtenir et la nature de la chair traitée.
Le quatrième produit peut être constitué de l'une ou de plusieurs denrées énumérées dans le quatrième point.

Cinquième étape :

Après lavage, la cinquième étape est une étape de finition. Elle peut être une étape simple ou combinée du type séchage, étuvage, fumage, congélation.
Pour une diversification ou extansion de la gamme pouvant être appliquée à toutes les espèces, d'autres phases peuvent y être ajoutées telle que : séchage, et/ou addition d'épices, et/ou d'aromates, et/ou ionisation, et/ou mise sous vide ou sous atmosphère contrôlée et/ou tout autre procèdé existant à ce jour et à venir. Un glacage pourra être pratiqué à l'aide de la gelée.

Sixième étape :

Conditionnement soit entier et/ou tranché et/ou en morceaux de toutes formes et/ou en bouillie, et/ou broyé et présenté sous tout aspect avec tout accompagnement de contact ou non jusque et y compris les gelées aromatisées ou non, les boyaux, terrines etc...

L'avantage de la présente invention réside dans les faits

1° - que la chair d'animaux aquatiques crue pourra être conservée à des températures positives plus de 4 jours et pourra donc être commercialisée.

2° - que le travail qui est ainsi effectué sur ces chairs d'animaux aquatiques confère une saveur qui peut être variable en fonction de la chair, et/ou du résultat final à obtenir.

3° - que les principes nutritifs ne sont en aucun cas altérés par le travail de conservation et que cette chair peut être consommée crue, ce qui est un avantage certain pour la santé car elle conserve sa teneur en EPA-DHA, des AGE reconnus par le corps médical comme étant très bénéfiques pour la santé, riche en vitamines, sels-minéraux, oligo-éléments tous principes qui ne sont pas détruits par une élévation de température.

La présente invention est illustrée par l'exemple non limitatif de réalisation ci-après.

" Procèdé de fabrication du filet de hareng " : filet de 8o grammes origine Baltique.

- mettre les filets au sel pendant 3 heures à raison de 50 grammes de sel par kilogramme et 1/3 de décilitre d'eau.
- Rincer abondamment et sécher.
- Préparer une marinade avec pour base :
  - . Crème fraîche liquide .....15 %
  - . Huile de noix .....30 %
  - . Vinaigre de franboise .....30 %
  - . Echalottes .....10 %
  - . Jaunes d'oeuf de poule .....3 %
  - . Ratafia de bourgogne (Irancy rouge de préférence .....12 %
- mettre les filets à mariner à ~4° celsius pendant 48 heures.
- rincer, sècher.
- emballer sous vide.

REVENDICATIONS

1° - Procèdé de préparation de chair d'animaux aquatiques de mer et d'eau douce caractérisé en ce qu'il concerne les étapes suivantes :

- séparation de la chair des parties indésirables tels que peau, squelettes, arêtes, carapaces et/ou coquilles, et/ou viscères, facultativement
- les arêtes, carapaces, têtes, et tous déchets résultant de l'étape précédentes, sont broyés finement, mis à cuire et réduits au feu afin d'obtenir une gelée aromatisée et parfumée destinée à glacer le produit fini.
- traitement de la chair au sel dont le mode, les quantités et la durée sont fonction des déterminations des teneurs en lipides, humidité, ABVT, HPD et/ou HPDA. Il est également tenu compte du poids, de la taille, de l'épaisseur, des origines animales et/ou géographique de la chair.
- lavage suivi d'un essuyage et/ou étuvage et/ou séchage.
- trempage dans une solution de traitement de conservation, d'aromatisation et de parfumage.
- lavage suivi d'un traitement de finition.
- glaçage à la gelée facultatif.
- conditionnement du produit ainsi traité.

2° - Procèdé selon la revendication 1 caractérisé en ce que le temps de traitement au sel varie de 1 minute à 40 jours avec une teneur en sel de 1 milligramme à 500 grammes par kilogramme de produit en traitement.

3° - Procèdé selon la revendication 1 caractérisé en ce que la solution de traitement de conservation, d'aromatisation et de parfumage est constituée d'une base comprenant les trois éléments suivants en quantité variant de 1 % à 90 % : acides gras, lait et/ou ses dérivés, vinaigres et/ou leurs dérivés, à laquelle base est ajoutée un ou plusieurs éléments pris dans le groupe ci-après.

. jus de fruits fermentés ou non, alcoolisés ou non et/ou leur dérivés,
. tous types de vins et/ou leurs dérivés,
. tous alcools et/ou leurs dérivés,
. tous jus de légumes, légumes broyés et/ou leurs dérivés,
. tous champignons et/ou leurs dérivés,
. fruits, sucre, sucres.
. toutes liqueurs et/ou leurs dérivés,
. tous arômes, aromates, parfums, colorants et additifs utilisés dans l'élaboration des différents parfums et saveurs.

4° - Procèdé selon revendication 1 caractérisé en ce que le broyage , la cuisson et la réduction, l'aromatisation et le parfumage des carcasses et déchets hors viscères sert au glaçage du produit fini.

5° - Procèdé selon revendication 3 caractérisé en ce que le temps de traitement varie d'une minute à 40 jours, les températures variant des tempé-
3 ratures négatives aux températures d'ébullition et/ou vaporisation.

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DOCUMENTS CONSIDERES COMME PERTINENTS

Catégorie	Citation du document avec indication, en cas de besoin, des parties pertinentes	Revendications concernées de la demande examinée
A	EQUINOXE, no. 15, juin-juillet 1987, pages 4-6, Nantes, FR; "Les marinades de produits de la mer" * Page 5, colonne 3 * ---	1,3
A	S.L. KOMARIK: "Food products formulary meats, poultry, fish, shellfish", vol. 1, 1974, pages 283,297, The Avi Publishing Co., Inc., Westport, Connecticut, US * Page 283, paragraphe 5 * ---	1,3
A	FR-A- 987 877 (BARTELSEN) * Résumé * ---	1
A	FR-A- 941 959 (GJÖLBERG) * Page 1, lignes 29-30; page 2 * ---	1
A	MONTAGNE: "Nouveau Larousse Gastronomique", 1967, pages 446,532,476-477, Librairie Larousse, Paris, FR * Page 446, paragraphe 13; page 532, paragraphes 6-7; page 476, paragraphe 14; page 477, paragraphe 1 * ---	1,4
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(57) Abstract

A multi-functional marinade for fish and meat products that adds flavor to the fish or meat product and improves the texture and color of the fish or meat product during cooking. The marinade does not require the addition of other ingredients and can be applied immediately before cooking. The marinade can be a solid powder that is coated on the food or a liquid that is brushed or sprayed on the food.

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MULTICOMPONENT MARINADES

Technical Field

The present invention relates to a marinade for fish and meat products and to a process for flavoring the fish or meat products with the marinade.

Background Art

Food products such as chicken, meats, and fish are often marinated before they are cooked. Marinades are known that add flavor to food products, that prevent the food products from losing moisture during cooking, or that effect the appearance of the cooked product.

Food products such as chicken, meat, and fish may be treated with a marinade before being cooked to minimize moisture loss during cooking, thus providing a juicier cooked product. European Patent 576,276 discloses a food coating to retain fluids in meat during cooking or storage. The coating consists of albumen, milk protein, starch and water. The food coating may also contain edible oil, salt, and unmodified starch. The coated food is heated to partially coagulate the albumen, denature the milk protein, and gelatinise the starch. The heat treated cooked food is then combined with sauces, retorted or vacuum packed, and heated to microbiological stability. The coating enhances fluid retention in the food during its preparation for immediate or subsequent consumption and during storage.

European Patent 643,923 discloses a coating for fish or meat that is a dry particulate mixture of 5-50 weight percent heat set protein and 95-50 weight percent unmodified starch. The ratio of protein to starch is 2-6:10. The

protein is egg white protein or albumen and the starch is potato starch. After coating, the meat or fish is cooked, heated to an appropriate internal core temperature, and chilled or deep frozen. The coating enhances moisture retention during food preparation and storage.

It is also known to coat foods in order to impart a certain appearance to the cooked food product, such as a browned appearance. U.S. Patent No. 4,640,837 discloses a coating composition for imparting a crisp golden brown surface to foodstuffs cooked in a microwave. The coating includes a blend of bread crumbs and oil, dextrin, pre-gelatanized starch, and soy protein concentrate.

Similarly, Australian Patent 96-70,458 discloses a coating mix composition which when coated onto moistened vegetables imparts a crisp golden brown texture with the taste, texture, and appearance of a fried food coating when the vegetables are baked. The product is neither oily or soggy. The composition includes bread crumbs, partially hydrogenated vegetable oil, modified starch, powdered shortening, carbohydrate adhesive, protein, vegetable lecithin, and seasonings.

Marinades that add flavor to food products are also known. A variety of marinades are commercially available to consumers which impart a variety of flavors to chicken, meats, and fish. These marinades typically require that an acidulant like vinegar, wine, or yogurt and oil be added before marinating. Moreover, it is necessary to marinate the food product for several hours or longer before cooking the food.

Currently there is no single marinade that can simultaneously add flavor, retain moisture, and brown the food in a single product. Thus, there remains a need for a

marinade of this type so that flavor can be enhanced while the texture and color of the food product after cooking can be maintained. Furthermore, it would be desirable to have a marinade that does not require additional ingredients such as oil, vinegar, wine, or yogurt and does not require that the food product be marinated for a long period of time before cooking. Ideally, the marinade would be a solid powder that could be coated on the food or a liquid that could be sprayed or brushed on the food and would not require the food to be held for a long time prior to cooking. The present invention resolves this need.

Summary of the Invention

The present invention provides a multi-functional marinade for fish or meat products. The multi-functional marinade includes three components. The first component is at least one flavoring agent in an amount sufficient to impart a flavor to the cooked product. The second component is a browning agent in an amount sufficient to impart a brown color to the cooked product. The browning agent includes a chromogen, a filler, and an enzyme modified ingredient. The enzyme modified ingredient is preferably a mixture of a carbonate and a dairy source that has been treated with a lactase, a protease, and then spray dried. The third component is partially hydrogenated fat in an amount sufficient to improve the mouthfeel of the cooked product.

The multi-functional marinade may also include a fourth component. The fourth component is a texture improvement agent in an amount sufficient to reduce moisture loss during cooking of the fish or meat product. The texture improvement agent typically includes a starch such as an

oxidized starch or unmodified starch, and a protein, such as egg white powder, soy protein or whey protein.

Generally, the multi-functional marinade may be in the form of a dry powder, or in a liquid form. The liquid form may be a water-in-oil or oil-in-water emulsion prepared by mixing the dry powder with oil and water.

The invention also relates to a process for flavoring a fish or meat product by contacting the fish or meat product with the multi-functional marinade and then cooking the product to obtain an enhancement in flavor, texture, or color. The chicken or meat is cooked to a core temperature of between about 145° to 180°F. The method of cooking is at least one selected from the group consisting of grilling, steam cooking, oven cooking in conduction ovens, oven cooking in convection ovens, deep-frying, pan frying, and microwave cooking.

Detailed Description of Preferred Embodiments

The present invention relates to a multi-component marinade for a fish or meat product that can be conveniently applied. The term "fish or meat product" means any edible product that contains any fish or meat as the primary components. "Meat" includes chicken, beef, pork, lamb, turkey, or others whether used alone or in combination in a food product that is to be cooked before eating. The marinade enhances at least one of flavor, texture, or color of the final product.

The marinade may be used as a dry blend, or may be suspended in an emulsion to give a liquid multi-component marinade. The liquid marinade is a water-in-oil or an oil-in-

water emulsion. The marinade flavors the fish or meat, retains moisture in the fish or meat, and browns the fish or meat when it is cooked. The marinade can be used with any method of cooking including, but not limited to, grilling, steam cooking, oven cooking, deep-frying, pan frying, microwave cooking, and cooking in a COMBI-OVEN™ (commercially available from Altosham Inc. of Menomonee Falls, WI). The marinade includes three components: a flavor component, a browning agent, and partially hydrogenated fat. The marinade may optionally include a fourth component which is a texture improvement agent.

The flavoring agent is present in an amount of about 10-60 percent by weight of the marinade. Preferably, the flavoring agent is present in an amount of about 20-50 percent by weight of the marinade and more preferably in an amount of 35-45 percent by weight of the marinade.

The browning agent is present in an amount of about 1-15 percent by weight of the marinade, preferably about 2-8 percent by weight of the marinade, and more preferably 3-5 percent by weight of the marinade.

The partially hydrogenated fat is present in an amount of about 10-60 percent by weight of the marinade, preferably about 15-35 percent by weight of the marinade, and more preferably 18-22 percent by weight of the marinade.

The texture improvement agent, if present, is present in an amount of about 30-60 percent by weight of the marinade, preferably about 32-38 percent by weight of the marinade.

The flavoring agent can be any blend of ingredients which are generally used in the food industry to flavor fish and/or meats. The flavoring agent is in a powdered form so

that it can easily be mixed into the dry form of the marinade or into the emulsion. By flavoring agent is meant any ingredient which imparts flavor or taste to a food product.

Flavoring agents useful in the invention include, but are not limited to, seasonings, herbs, spices, salt, pepper, onion powder, garlic powder, other savory powders, oleoresins, and commercially available flavorings. Examples of commercially available flavorings include barbecue, southwestern, mesquite, cajun, garlic and herb, and teriyaki.

The browning agent is present to impart a desirable appearance to the cooked food. Preferably the browning agent imparts a roasted brown appearance to the cooked fish or meat. The browning agent of the present invention includes chromogens, a filler, and an enzyme modified protein.

Chromogens are ingredients which naturally impart color to a food product. Chromogens, useful with the present invention include, but are not limited to, caramel color, annatto natural color, tumeric, paprika, tea leaves, and the like. Generally the chromogens are present in an amount of about 1-60 percent by weight of the browning agent, preferably about 2-40 percent and more preferably about 10-20 percent.

Preferred chromogens are caramel color, for example, CARAMEL COLOR BC420 (commercially available from Sethness Products Co. of Chicago, IL); annatto natural color, for example, ANNATTO TYPE WJ810 (commercially available from Warner Jenkinson Cosmetic Co. of South Plainfield, NJ); and tumeric, for example, TUMERIC TYPE 30 (commercially available from Kalsec Inc. of Kalamazoo, MI). The caramel color when used is present in an amount of about 10-40 percent by weight of the browning agent, preferably 12-30 percent by weight of

the browning agent, and more preferably 15-22 percent by weight of the browning agent. Annatto natural color when used is present in an amount of about 0.5-4 percent by weight of the browning agent, preferably 1-3 percent by weight of the browning agent, and more preferably 1.5-2.5 percent by weight of the browning agent. Tumeric when used is present in an amount of about 0-2 percent by weight of the browning agent, preferably 0.5-1.5 percent by weight of the browning agent, and more preferably 0.75-1.25 percent by weight of the browning agent.

The filler can be any filler. By filler is meant any inert material. Preferably the filler is a maltodextrin having a dextrose equivalent (DE) of between about 5 and 40. The filler is present in an amount of about 1-80 percent by weight of the browning agent, preferably 30-70 percent by weight of the browning agent, and more preferably, 60-70 percent by weight of the browning agent. Other fillers which may be used in the browning agent include unmodified starch and sweet whey.

The enzyme modified protein of the browning agent is an enzyme modified dairy source combined with a carbonate compound such as sodium bicarbonate ($NaHCO_3$). The enzyme modified dairy source is obtained by treating one or more dairy sources with a lactase and a protease. The dairy source can be any raw material derived from milk that is high in lactose. By high in lactose is meant a product having at least 10 percent lactose. The dairy source includes, but is not limited to milk, cheese, casein, whey, and non-fat dry milk. In addition, wheat gluten hydrolysate may be used in place of the dairy source. Preferably the dairy source is non-fat dry milk or whey protein isolate, such as LACPRODAN 80

(commercially available from MD Foods Ingredients of Union, NJ). Any lactase can be used, a suitable lactase, for example, is LACTOZYME™ (commercially available from Novo Nordisk Biochem North America of Franklinton, NC). Any protease may be used, a suitable protease, for example, is FLAVOURZYME™ (commercially available from Novo Nordisk Biochem North America of Franklinton, NC).

The enzyme modified ingredient is generally prepared by treating the dairy source dissolved in water at a concentration of about 30 percent w/v with about 0.01 to 2 percent w/v of the lactase, preferably about 0.25-1 percent w/v of the lactase, at a temperature of about 45°C, for about 2 hours. Following enzymatic hydrolysis with a lactase the solution of the dairy source is then treated with a protease in an amount of about 0.05 percent w/v, at a temperature of about 40-45°C, for about 6 hours. The resulting solution is then spray dried to produce a dry powder of the enzyme modified dairy source. A carbonate such as sodium bicarbonate is added to the spray dried enzyme modified dairy source in an amount of about 2-20 percent by weight of the spray dried enzyme modified dairy source, preferably about 10 percent by weight of the spray dried enzyme modified dairy source to give the enzyme modified ingredient. Browning of the fish or meat is enhanced when the enzyme modified ingredient is under alkaline conditions. The carbonate is added to provide the necessary alkaline conditions.

Without wishing to be bound by theory it is believed that the enzymes generate reducing sugars and amino acids as browning precursors. The lactase hydrolyzes lactose to form glucose and galactose and the protease hydrolyzes proteins in the dairy source to produce amino acids. When heated the

amino acids react with the glucose or galactose to produce compounds which cause browning of the fish or meat.

The enzyme modified ingredient is present in an amount of about 40-80 percent by weight of the browning mixture, preferably 50-75 percent, by weight of the browning mixture and more preferably 60-70 percent by weight of the browning mixture.

The preferred browning agent for oven cooking, deep frying, or pan frying is 70-80 percent maltodextrin, 20-40 percent caramel color, 1-3 percent annatto, and 1-2 percent turmeric.

The preferred browning agent for microwave cooking is 50-75 percent enzyme modified ingredient, 20-40 percent caramel color, and 1-3 percent annatto.

The partially hydrogenated fat is added to the marinade to give a better mouthfeel to the cooked fish or meat product. Any partially hydrogenated fat that is a solid at room temperature can be used. Thus, the partially hydrogenated fat should have a solid fat index of greater than 65 percent, and preferably greater than about 80 percent. Partially hydrogenated fats include, for example, soy bean oil, cottonseed oil and palm fat. The preferred partially hydrogenated fat is soy bean oil.

The texture improvement agent, when present in the marinade, is present to improve moisture retention of the fish or meat when it is cooked. The texture improvement agent leads to a more moist and juicy cooked product. The texture improvement agent includes at least one of an oxidized starch, such as BATTERCRISP 05330 (commercially available from Crestar Food Products Inc. of Richfield, OH) or a unmodified corn starch, such as MELOGEL (commercially available from National

Starch and Chemical of Hawthorne, NJ) and at least one of egg white powder or whey protein isolate. Optionally, the texture improvement agent may also include soy, protein, salt, and gelatin.

The oxidized starch or unmodified starch is present in an amount of 20-80 percent by weight of the texture improvement agent, preferably 40-70 percent by weight of the texture improvement agent, and more preferably about 55-65 percent by weight of the texture improvement agent. The egg white powder is present in an amount of up to about 30 percent by weight of the texture improvement agent, preferably, about 10-25 percent by weight of the texture improvement agent, and more preferably about 12-18 percent by weight of the texture improvement agent. Whey protein isolate such as LACPRODAN 80 (commercially available from MD Foods Ingredients of Union, NJ) is present in an amount of up to about 25 percent by weight of the texture improvement agent, preferably, about 5-20 percent, and more preferably about 8-12 percent by weight of the texture improvement agent.

Soy protein isolate, such as SUPRO 660 (commercially available from Protein Technologies International, Inc. of Saint Louis, MO), may optionally be included in the texture improvement agent. Soy protein isolate is added to enhance the moisture retention or act as a replacement for the egg white powder in the formula. Soy protein isolate, when included in the texture improvement agent, is present in an amount of from 0-25 percent by weight of the texture improvement agent, preferably from 8-25 percent by weight of the texture improvement agent, and more preferably from about 11-15 percent by weight of the texture improvement agent.

Salt is optionally present in the texture improvement agent. Salt is added to enhance flavor especially when the texture improvement agent is used by itself. When present salt is included in an amount from about 0-20 percent by weight of the texture improvement agent, preferably from about 4-16 percent by weight of the texture improvement agent, and more preferably from about 6-10 percent by weight of the texture improvement agent.

Gelatin may also be optionally included in the texture improvement agent. Gelatin is added to improve the crunchiness and crispness of the coating and thus is preferred in deep frying applications. When present gelatin is included in an amount of up to about about 0-40 percent by weight of the texture improvement agent.

The amount of each component of the texture improvement agent can be varied so as to maximize performance in specific ovens. For example, a texture improvement agent having about 70-80 percent oxidized starch is preferable for chicken or meat that will be steam cooked. For a chicken or meat that is cooked in an oven about 70-80 percent unmodified corn starch is preferable and for deep fat frying a texture improvement agent having about 40-60 percent gelatin is preferable.

The preferred texture improvement agent for oven cooking includes 60-70 percent unmodified starch, 12-18 percent egg white or soy protein, 10-15 percent whey protein isolate, and 5-10 percent salt.

The preferred texture improvement agent for deep fat frying includes, 30-50 percent gelatin, 20-30 percent oxidized starch, and 0-15 percent egg white or soy protein or whey.

The preferred texture improvement for steam or high moisture cooking agent includes 65-75 percent oxidized starch, 12-18 percent egg white or soy protein, 10-15 percent whey protein isolate and 5-10 percent salt.

The texture improvement agent generally gives an improved percent yield after cooking of greater than about 5 percent, preferably greater than about 10 percent compared to an un-marinated food product. By percent yield after cooking is meant the weight of a piece of fish or meat after cooking compared to the weight before cooking. A higher percent yield indicates less weight loss during cooking. The reduction in weight for marinated fish and meat products is attributed to less moisture being lost during cooking. Without wishing to be bound by theory it is believed that the texture improvement agent prevents moisture loss in two ways. It is believed that heating denatures the egg white powder and/or whey protein and gelatanizes the starch to create a physical barrier to moisture loss. In addition, the starch acts as a water binder to inhibit the escape of moisture from the product.

The flavor component, browning agent, partially hydrogenated fat, and texture improvement agent, if present, are mixed and dry blended to make the marinade in powdered form. A ribbon blender or any similar machine can be used to blend the ingredients of the marinade. These machines are well known in the art and need not be described in further detail here.

A liquid marinade can also be prepared by suspending the powdered marinade in an oil-in-water or a water-in-oil emulsion. The liquid marinade can be prepared by heating vegetable oil, a partially hydrogenated oil, such as cottonseed oil, and an emulsifier, such as DIMODAN™

(commercially available from Danisco of Kansas City, KS) to about 60°C or until a clear solution forms and then cooling the solution to about 40°C. To the resulting mixture of oils is added water which may optionally contain coloring. The oil and water mixture is then mixed and homogenized at a high shear rate to form a stable emulsion. Methods for homogenizing oil and water mixtures are well known in the art and need not be described here. To the resulting emulsion is added the powdered multi-component marinade that may have plated oleoresin. The powdered multi-component marinade and the emulsion and are then mixed to form a suspension.

The ratio of oil to water determines what type of emulsion is formed. For an oil-in-water emulsion a higher amount of water is used and for a water-in-oil emulsion a higher amount of oil is used. For a liquid marinade the amount of water in the liquid marinade is about 5-80 percent by weight of the liquid marinade. For water-in-oil emulsions the amount of water in the liquid marinade is preferably about 10-20 percent by weight of the liquid marinade and more preferably about 12-18 percent by weight of the liquid marinade.

The amount of vegetable oil, such as soybean oil, in the liquid marinade is about 5-75 percent by weight of the liquid marinade. For oil-in-water emulsions the amount of oil in the liquid marinade is preferably about 35-65 percent by weight of the liquid marinade, and more preferably about 45-55 percent by weight liquid marinade.

The amount of hydrogenated oil in the liquid marinade is about 1-10 percent by weight of the liquid marinade, preferably about 2-8 percent by weight of the liquid

marinade, and more preferably about 3-5 percent by weight of the liquid marinade.

The amount of emulsifier in the liquid marinade is about 2-10 percent by weight of the liquid marinade, preferably about 3-8 percent by weight of the liquid marinade, and more preferably about 5-6 percent by weight of the liquid marinade. The type of emulsifier used is dependent on the type of emulsion required. The art of selecting emulsifiers and forming stable emulsions is well documented and need not be described here.

The amount of powdered multi-functional marinade in the liquid marinade is about 10-40 percent by weight of the liquid marinade, preferably about 15-30 percent by weight of the liquid marinade, and more preferably about 20-26 percent by weight of the liquid marinade.

The marinades of the invention are applied to the fish or meat product before it is cooked. The fish or meat can be fresh, frozen, or frozen and thawed. Preferably, the meat is fresh or frozen and thawed. The dry marinade is applied to the fish or meat by dredging the fish or meat in the marinade. Preferably the fish or meat is patted dry before being dredged. The powdered marinade is coated on the fish or meat at a level of at least 4 percent by weight of the fish or meat, preferably at 6-8 percent by weight of the fish or meat. The oil emulsion marinade is sprayed or brushed on the fish or meat. The liquid marinade is coated on the fish or meat at a level of at least about 6 percent by weight of the fish or meat, preferably at about 10-12 percent by weight of the chicken or meat. Preferably, the fish or meat is coated on all sides. The fish or meat coated with marinade is then cooked for an appropriate amount of time so that the fish or

meat reaches a core temperature of about 145°-180°F, preferably about 160°F. By core temperature is meant the temperature of the fish or meat at the middle of its thickest point. Cooking can be accomplished by any means including, but not limited to grilling, steam cooking, oven cooking in conduction and convection ovens, deep-frying, pan frying, microwave cooking, and cooking in a COMBI-OVEN™ (a combination of steam and heat convection). The resulting cooked product has a golden brown color and a roasted appearance. In addition, the flavoring component adds additional flavor to the fish or meat. Furthermore, if the texture improvement agent is present in the marinade the marinated fish or meat is more moist and juicy than the non-marinated fish or meat. Moreover, samples that are cooked and cooled to room temperature and then reheated in a microwave show minimal change. Similarly, cooked fish or meat that is been kept warm in a COMBI-OVEN™ for 2 hours at 160°F retains its good texture and appearance.

Examples

The invention is further defined by reference to the following examples described below. The examples are representative and should not be construed to limit the scope of the invention in any way. In these examples percentages are given as weight percents unless otherwise indicated.

Example 1. Southwestern Marinade

A dry multi-functional food marinade according to the invention was prepared according to the following procedure:

1. Sub-recipes of each component were batched up in a ribbon blender. The sub-recipes are provided in Tables 1-3.

2. The sub recipes were then used to form the final dry blend (Table 4).

Table 1. Southwest Flavor Blend

Ingredient	Amount
Salt	21.83%
TOMATO POWDER 404[a]	23.08%
Chili Powder[a]	13.03%
Yeast Extract Powder[a]	10.87%
Chicken Flavor Powder[a]	9.06%
Cilantro Powder[a]	9.03%
Onion Powder (DURAROME®)[a]	5.03%
Sugar Granulated[a]	3.03%
Garlic Flavor(DURAROME®)[a]	1.83%
Black Pepper (MCCORMICK 773442)[a]	1.71%
Citric Acid Powder[a]	1.50%

[a] TOMATO POWDER 404 is commercially available from Spreda U.S.A., Inc. of Louisville, KY; Chili Powder and Black Pepper are commercially available from McCormick and Co., Inc. of Hunt Valley, MD; Yeast Extract Powder is commercially available from food Ingredients Specialty, Inc. of Solon, OH; Chicken Flavor Powder

is commercially available from International Flavor and Fragrances of New York, NY; Cilantro Powder is commercially available from Basic Vegetable Products LP of Modesto, CA; DURAROME® Onion Powder and Garlic Flavor are commercially available from Firmenich of Newark, NJ; Granulated Sugar is commercially available from Domino Sugar of Baltimore, MD, Citric Acid Powder is commercially available from ADM Food Additives Division, Decatur, IL.

Table 2. Browning Agent

Ingredient	Amount
Enzyme modified dairy Ingredient	61.40%
Sodium bicarbonate	13.50%
CARAMEL COLOR BC420[a]	24.10%
ANNATTO TYPE WJ 810[a]	1.00%

[a] CARAMEL COLOR BC420 is commercially available from Sethness Products Co. of Chicago, IL; ANNATTO TYPE WJ 810 is commercially available from Warner Jenkinson Cosmetic Co. of South Plainfield, NJ.

Table 3. Texture Improvement Agent

Ingredient	Amount
Starch (BATTERCRISP 05330)[a]	25.76%
Gelatin	41.02%
SUPRO 660[a]	12.57%

Egg White Powder[a]	12.44%
Whey Protein Isolate (LACPRODAN 80)[a]	8.21%

[a] BATTERCRISP 05330 is commercially available from Crestar Food products, Inc. of Richfield, OH; SUPRO 660 is commercially available from Protein Technologies International, Inc. of Saint Louis, MO; Egg White Powder is commercially available from Henningsenn Foods, Inc. of David City, NE; LACPRODAN 80 is commercially available from MD Foods Ingredients of Union, NJ.

Table 4. Multi-component General Formula

Ingredient	**Amount**
Southwest Flavor Sub-recipe	22.20%
Browning Agent sub-recipe	5.49%
Texture Improvement Agent Sub-recipe	44.22%
Partially Hydrogenated Soybean Oil	28.09%

Example 2

A liquid multi-functional food marinade according to the invention was prepared according to the following procedure:

1. Vegetable oil, DIMODAN™(commercially available from Danisco of Kansas City, KS) and partially hydrogenated oil was

heated to 60°C or until the solution turned clear. The solution was then cooled to 40°C.

2. Water was added to the mixture of oils and the resulting mixture homogenized with a POLYTRON™ (commercially available from KINEMATIC GmbH of Switzerland) to form a stable emulsion.

3. Oleoresin and color were plated on the dry blend of the marinade.

4. The dry blend of the marinade was then added to the emulsion and the emulsion mixed to from a suspension.

Table 5 Composition of Liquid Multi-functional Marinade.

Ingredients	Amount
DRY MIX	
Salt	4.23%
Natural Flavors	5.00%
Yeast Extract Powder	2.44%
Spices	7.00%
Ribotides	2.03%
TOMATO POWDER 404	1.35%
Starch Modified	1.29%
WATER MIX	
Water	16.00%

Natural Colors	0.40%
OIL MIX	
Vegetable oil	49.26%
Partially hydrogenated Cottenseed oil	4.00%
Emulsifier DIMODAN™	6.00%
Oleoresin[a]	1.00%
TOTAL	100.00%

[a] Oleoresins are commercially available from Kalsec Inc. of Kalamazoo, MI and McCormick and Co., Inc. of Hunt Valley, MD.

In both examples, the chicken marinated with the multi-functional marinade was cooked in a COMBI-OVEN™ at 330°F for 3 minutes with steam followed by 6-9 minutes cooking with dry heat. The yield of the cooked chicken was between 82-94 percent. The cooked chicken had a golden brown color.

Claims

What is claimed is:

1. A multi-functional marinade comprising:

at least one flavoring agent in an amount sufficient to impart a flavor to a cooked fish or meat product that contains the marinade;

a browning agent in an amount sufficient to impart a brown color to a cooked fish or meat product that contains the marinade comprising a chromogen, a filler, and an enzyme modified ingredient; and

a partially hydrogenated fat in an amount sufficient to improve the mouthfeel of a cooked fish or meat product that contains the marinade.

2. The multi-functional marinade of claim 1 wherein the flavoring agent is present in an amount of about 20-50 percent by weight of the marinade, the browning agent is present in an amount of about 1-15 percent by weight of the marinade, the partially hydrogenated fat is present in an amount of about 10-60 percent by weight of the marinade.

3. The multi-functional marinade of claim 1 wherein the flavoring agent is selected from the group consisting of seasonings, herbs, spices, salt, pepper, onion powder, garlic powder, savory powders, and commercially available flavorings.

4. The multi-functional marinade of claim 1 wherein the chromogen is at least one chromogen selected from the group consisting of caramel color, annatto color, paprika, tumeric,

and tea leaves; the filler is maltodextrin; and the enzyme modified ingredient is a mixture of a carbonate and a dairy source that has been treated with a lactase and a protease and spray dried.

5. The marinade of claim 4, wherein the chromogen is present in the browning agent in an amount of about 1-60 percent by weight, the filler is present in the browning agent in an amount of about 1-80 percent by weight, and the enzyme modified ingredient is present in the browning agent in an amount of about 40-80 percent by weight, and the carbonate is present in an amount of about 2-20 percent by weight of the spray dried enzyme modified dairy source.

6. The multi-functional marinade of claim 5 wherein the carbonate is a bicarbonate or an alkali metal hydrogen carbonate, and the dairy source is at least one selected from the group consisting of non-fat dry milk and sweet whey.

7. The multi-functional marinade of claim 1 wherein the partially hydrogenated fat has a solid fat index of greater than 65 percent and is selected from the group of soybean oil, cotton seed oil, and palm fat.

8. The multi-functional marinade of claim 1 in the form of a dry powder.

9. A multi-functional marinade of claim 1 in liquid form, wherein the liquid is oil or water.

10. The multi-functional marinade of claim 9 wherein the liquid form is an oil-in-water or water-in-oil emulsion, wherein the emulsion comprises water, vegetable oil, partially hydrogenated oil, emulsifier, and oleoresin.

11. The multi-functional marinade of claim 10 wherein the water is present in an amount of about 5-75 percent by weight, the vegetable oil is present in an amount of about 25-75 percent by weight, the partially hydrogenated cottonseed oil is present in an amount of about 1-10 percent by weight, and the emulsifier is present in an amount of about 2-10 percent by weight.

12. The multi-functional marinade of claim 1 further comprising a texture improvement agent in an amount sufficient to reduce moisture loss during cooking of a fish or meat product that contains the marinade comprising at least one starch selected from the group of oxidized starch and unmodified starch, and at least one protein selected from the group of egg white powder, soy protein and whey protein.

13. The multi-functional marinade of claim 12 wherein the flavoring agent is present in an amount of about 20-50 percent by weight of the marinade, the browning agent is present in an amount of about 1-15 percent by weight of the marinade, the partially hydrogenated fat is present in an amount of about 10-60 percent by weight of the marinade, and the texture improvement agent is present in an amount of about 30-60 percent by weight of the marinade.

14. The multi-functional marinade of claim 12 wherein the oxidized or unmodified starch of the texture improvement agent

is present in an amount of about 20 to 80 percent by weight of the texture improvement agent, the egg white powder of the texture improvement agent is present in an amount of up to about 30 percent by weight of the texture improvement agent, or the whey protein of the texture improvement agent is present in an amount of up to about 25 percent by weight of the texture improvement agent.

15. The multi-functional marinade of claim 14 wherein the texture improvement agent further comprises soy protein, salt, or gelatin; with the soy protein being present in an amount of up to about 20 percent by weight of the texture improvement agent, the salt being present in an amount of up to about 20 percent by weight of the texture improvement agent, and the gelatin being present in an amount of up to about 40 percent by weight of the texture improvement agent.

16. A process for flavoring a fish or meat product comprising:

contacting the fish or meat product with the multi-functional marinade of claim 1; and

cooking the product to enhance at least one of flavoring, texture, or color of the cooked product.

17. The process of claim 16 wherein the fish or meat product is cooked to a core temperature of between about 145° to 180°F by grilling, steam cooking, oven cooking in conduction or convection ovens, deep-frying, pan frying, or microwave cooking of the product.

18. A process for flavoring a fish or meat product comprising:

contacting the fish or meat product with the multi-functional marinade of claim 9; and

cooking the fish or meat product to enhance at least one of flavor, texture, or color of the cooked product.

19. The process of claim 18 wherein the fish or meat product is cooked to a core temperature of between about 145° to 180°F by grilling, steam cooking, oven cooking in conduction or convection ovens, deep-frying, pan frying, or microwave cooking of the product.

INTERNATIONAL SEARCH REPORT

Int. Ional Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A23L1/40 A23L1/325 A23L1/314 A23L1/31 A23L1/176
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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A23L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ, FSTA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 586 512 A (MANCUSO JOHN J ET AL) 22 June 1971 (1971-06-22) claims 1-11; examples 4,5 column 2, line 51-62 column 3, line 12-35 column 4, line 16-44 column 5, line 11-20,69-75 column 6, line 5-12,26-52,73-75	1,3,8,9, 16-19
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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Tallgren, A

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INTERNATIONAL SEARCH REPORT

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PCT/EP 00/02495

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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(54) Title: CLEAR DAIRY DRINK AND METHOD FOR PRODUCING SAME

(57) Abstract: The present invention relates to a clear dairy drink, comprising a milk product as the main ingredient and having an extinction in the range of 400 to 800 nm, in particular at 654 nm of less than 1 and to a method for making such drink. The method for producing the drink comprises provision of a milk product of acid pH, which optionally further comprises a negatively charged polysaccharide; optionally subjecting the milk product or the mixture to a temperature treatment and/or homogenisation, and adjusting the pH of the milk product or the mixture to about neutral.

CLEAR DAIRY DRINK AND METHOD FOR PRODUCING SAME

The present invention relates to a clear dairy drink and a method for producing the drink.

In the food and drink industry there is a tendency to produce healthier products. On the other hand however, especially younger consumers prefer products having a more modern and dynamic image. Healthy products do not usually meet these requirements.

Dairy products, such as milk, are for example generally considered to be a healthy drink. Younger consumers do however usually prefer clear soft drinks.

It is therefore the object of the present invention to provide a clear drink based on milk.

In the research for a clear milk beverage, it was surprisingly found that adjusting the pH of an acidified milk drink that optionally comprises pectin to near neutral resulted in a clear dairy drink.

The object stated above is thus achieved according to the invention by a clear dairy drink, comprising a milk product as the main ingredient and having an extinction in the range from more than 400 to 800 nm of less than 1 measured in a quartz cell having an optical path length of 1 cm. The extinction in this nanometer range is preferably less than 0.8, more preferably less than 0.6, even more preferably less than 0.4, most preferably less than 0.2. It was found that 654 nm is particularly useful for measuring the extinction.

The preparation of clear whey protein-based beverages is known in the art (e.g. US 5,641,531). However, this concerns an acid beverage, using defatted whey protein isolate. Moreover, it does not mention the use of a negatively charged polysaccharide such as pectin.

A clear dairy drink according to the invention can be obtained by a method comprising the steps of:

a) providing a milk product of acid pH;

b) optionally subjecting the product to a temperature treatment and/or an optional homogenisation treatment, and

d) adjusting the pH of the product to about neutral.

The milk product of acid pH may for example be milk, buttermilk or yoghurt, the pH of which lies within the range between 3.8 and 4.2 and is preferably 4 and is either the natural pH (yoghurt or buttermilk) of the product or adjusted to the desired value (milk).

The milk product may optionally further comprise a negatively charged polysaccharide, such as pectin. The provision of a mixture of a negatively charged polysaccharide and a milk product of acid pH is for example achieved by mixing pectin and milk and adjusting the pH of the mixture to about 3.8 to 4.2, preferably to about 4.

Alternatively, the provision of a mixture of a negatively charged polysaccharide and a milk product of acid pH is achieved by mixing pectin and buttermilk or yoghurt. The milk products used here already have an acid pH around 4.

"Milk product" as used in this application is intended to comprise low-fat milk, skimmed milk, buttermilk and yoghurt. It is preferred to use milk having less than 0.5% fat.

It was surprisingly found that particularly good results can be obtained when UHT-treated milk is used.

The negatively charged polysaccharide, if present, is selected from the group consisting of pectin, alginate, carboxy methyl cellulose and polyglycol alginate, and is preferably pectin.

Pectin is usually classified according to its degree of esterification (DE). There are two main categories, namely low (methyl) ester (LM) pectin, having a DE of less than 50% and high (methyl) ester (HM) pectin having a DE of more than 50%. According to the invention pectin is used to stabilise the acidified protein during processing. For this function, both pectin types are suitable.

In addition to a milk product and optionally a negatively charged polysaccharide such as pectin, the mixture may further comprise one or more of the ingredients selected from the group consisting of sugar, fruit juice, fruit mix (a clear mixture of mashed fruits in which there may still be some cell material present), flavours, food-grade acids, such as lactic acid, malic acid, citric acid or mixtures thereof,

stabilisers, colorants, non-caloric sweeteners, maltodextrins, non-digestible fibers, nutritional ingredients, etc. Sugar can be used for adjusting the taste but also as a dispersion aid for pectin. Fruit juice and/or fruit mix are added to obtain the desired taste.

The main ingredient of the invention is the milk product as defined above. The ratio between the milk product and the other ingredients may be 80:20, preferably 65:35, more preferably 60:40. In dairy drinks of a low protein content the ratio varies from 40:60 to 35:65 to 20:80.

The amount of HM pectin, if present, based on the amount of the clear dairy drink lies between 0.10 and 0.55% (w/w), preferably between 0.35 and 0.45% (w/w) and is most preferably about 0.40% (w/w). The amount of LM pectin, if present, based on the amount of the clear dairy drink lies between 0.01 and 0.15% (w/w), preferably about 0.05% (w/w).

The about neutral pH to which the drink is adjusted to make it transparent is a pH between about 6 and 7.5, preferably about 6.5 and 7, more preferably about 6.75. It is preferred to use food grade means to adjust the pH back to neutral.

It was surprisingly found that the final transparency of the product varies with the acidifier used. Optimal transparencies were obtained with organic carboxylic acids having a chain length of 3 to 6 carbon atoms. Acids having 3 carbon atoms are lactic acid and malonic acid. Acids with 4 carbon atom are succinic acid and malic acid. Glutaric acid has 5 carbon atoms whereas citric acid and adipic acid each have 6 carbon atoms. The extinction at 654 nm of the clear dairy drink obtained when these acids are used to adjust the pH is lower than 1.

It was found that after adjusting the pH to an acidic value energy may optionally be added to the drink. Energy can be administered in the form of shear. High shear can be administered to the drink by means of a homogenisation treatment. An additional homogenisation may be performed either before or after adjusting the pH of the drink to about neutral. Preferably, the temperature of the homogenisation step is

approximately 55°C. The homogenisation treatments are performed at 150-250 bar, preferably 250 bar. Either of the two homogenisation treatments may also be performed more than once.

To safeguard a hygienic condition of the drink, it can optionally be heat treated, e.g. pasteurised. Such pasteurisation is a treatment of 10-20, preferably 15 seconds at 85-95°C, preferably 90°C. Alternatively, the drink can be microfiltered using an 0.2 µm filter to remove bacteria. An additional advantage of this filtering step is also that the extinction of the drink is lowered even further.

It was surprisingly found that a certain storage time at low temperature below 10°C, preferably below 8°C, optimally at 5°C during about 4 days, further increased the transparency of the drink. After heating the drink becomes again milky white. This effect can be reversed by cooling. Thus, the transparency induced by cooling is reversible.

The drink according to the invention can also be used as a basis for special nutritional applications, e.g. sports or diet drinks. Ingredients that may then be added in the process of making the clear drink, are e.g. peptide preparations enriched in specific amino acids. Only those nutritional ingredients will be used that will not reduce the clarity of the product. For example, the clear glutamine peptide WGE80GPA (from DMV International, the Netherlands) can be incorporated in such a drink.

It is furthermore possible to add lactic acid or probiotic bacteria. These should be added after the pasteurisation or microfiltration treatment in an amount that will not make the drink turbid again.

According to a very practical embodiment of the invention the clear dairy drink is provided in powdered form. After drying an acidified milk product the pH of which is brought back to neutral (e.g. pH 6.75) according to the invention, a powder is obtained that upon reconstitution with water gives again a clear dairy drink with an extinction at 654 nm below 1. The drying can be performed by means of spray drying, reduced pressure drying or microwave assisted drying and is preferably freeze drying.

The present invention is further illustrated in the Examples that follow. When pectin was used in the Examples it was 6 HM pectin (type JM 150; Hercules - Copenhagen (Denmark)) unless otherwise indicated.

EXAMPLES

EXAMPLE 1

General recipe for clear milk drink with pectin

The recipe for 1 kg milk drink of the invention is as follows.

4 g Pectin and 20 g sugar are mixed in dry form. The mixture thus obtained is dispersed in 267 g water at 80°C in a vortex and hydrated at the same temperature for 2 hours.

605 g skimmed UHT-milk is cooled to 4°C and 24 g sugar is added. The milk/sugar solution and pectin/sugar solution are mixed leading to a temperature of 20-25°C. The solution thus obtained is quickly cooled to 4°C in ice water.

An additional amount of either 80 g fruit concentrate or water is added. 20% (W/w) citric acid was added until a pH of 4 was reached.

After a pasteurisation treatment during 15 sec. at 90°C, the solution is cooled to about 55°C. Subsequently, the solution is homogenised after which the pH is adjusted with 8% sodium hydroxide or other food-grade base. The pH is adjusted to about neutral to obtain the clear dairy drink of the invention. After pH adjustment to neutral, an optional additional homogenisation treatment may be performed on the drink.

The transparency of thus obtained drink can be determined by measuring the extinction at 654 nm.

EXAMPLE 2

Determination of optimal pH

The mixture used in this series of experiments contains water instead of fruit concentrate. The pH was adjusted after homogenisation. Sample 5 was subjected to one or two extra homogenisation steps after 4 days storage at 4°C.

The results are shown in Table 1.

Table 1

Sample	pH	extinction at 654 nm (fresh sample)	extinction at 654 nm (after 4 days at 4°C)	turbidity (visual)
1	3.8	3.350	n.d.	milky
2	5.0	3.350	n.d.	milky
3	6.0	2.753	2.549	opaque
4	6.5	0.916	0.730	transparent
5	6.75	0.736	0.590	transparent
5a	6.75*	n.d.	0.196	clear
5b	6.75**	n.d.	0.189	clear
6	7.0	0.939	0.785	transparent

* one additional homogenisation step at 250 bar

** two additional homogenisation steps at 250 bar

From the table it follows that the appearance of the drink changes significantly in the pH range of 6 to 6.5. At a pH below 6 the drink is still milky, whereas it becomes transparent at a pH 6.5 or higher. The optimal pH in this setting is 6.75. It is found that extra homogenisation steps further improve the transparency.

The extinction of sample 5b was determined at a range of wavelengths varying from 400 to 800 nm. The results are given in Table 2.

Table 2

Wavelength (nm)	Extinction
400	1.0157
425	0.833
450	0.6947
475	0.5741
500	0.4661
525	0.3923
550	0.3373

575	0.2916
600	0.2546
625	0.2237
650	0.1981
675	0.176
700	0.175
725	0.1402
750	0.1264
775	0.1146
800	0.1144

From the table it follows that at a wavelength above 400 up till 800 nm the extinction of this drink is below 1.

Sample 5a from this example was subjected to microfiltration over a 0.2 µm filter. The extinction of the drink was reduced from 0.196 to 0.087.

EXAMPLE 3

Effect of temperature of the drink on transparency

The recipe for 1 kg milk drink of the invention is as follows.

4 g Pectin and 20 g sugar are mixed in dry form. The mixture thus obtained is dispersed in 267 g water at 80°C in a vortex and hydrated at the same temperature for 2 hours.

605 g skimmed UHT-milk is cooled to 4°C and 24 g sugar is added. The milk/sugar solution and pectin/sugar solution are mixed leading to a temperature of 20-25°C. The solution thus obtained is quickly cooled to 4°C in ice water.

An additional amount of either 80 g fruit concentrate or water is added. 20% (W/w) citric acid was added until a pH of 4 was reached.

After a pasteurisation treatment during 15 sec. at 90°C, the solution is cooled to about 55°C. Subsequently, the solution is homogenised twice at 200 bar and 55°C using a Rannie laboratory homogeniser. After cooling to 5°C the pH is adjusted with 8% sodium hydroxide to 6.75.

The drink thus obtained was once more homogenised at 100 bar. The extinction of the solution after 24 hours was 0.162. This drink was used for further experiments.

10 ml of the drink was filled in test tubes and where heated during 7 and 20 min. at 35, 45 and 55°C. Immediately after the heat treatment the tubes were cooled in ice and visually analysed. After 24 hours the extinction at 654 nm was determined. The results are given in table 3.

Table 3

Sample No.	heating		turbidity (visual)		Extinction at 654 nm
	$t_{(min)}$	$T_{(°C)}$	immediately after heating	after 24 hours at 4°C	after 24 hours
1 (reference)		<2	transparent	transparent	0.137
2	7	35	transparent	transparent	0.127
3	20	35	transparent	transparent	0.188
4	7	45	milky white	transparent	0.155
5	20	45	milky white	transparent	0.359
6	7	55	milky white	transparent	0.186
7	20	55	milky white	transparent	0.349

From the above table it follows that heating the samples leads to a turbidity that is reversed when the samples are stored in the fridge.

EXAMPLE 4

Effect of starting milk on final transparency of clear milk

This example shows the effect of the type of starting milk on the final transparency of a clear milk drink. Drinks were made from milk types of different origin and were all skimmed milks (fat < 0.06%). The following milk types were tested:

1. Defatted raw milk (source DMV-international, Veghel, The Netherlands)
2. Milk type 1 after pasteurisation for 3 minutes at 70°C

3. Milk type 1 after pasteurisation for 3 minutes at 90°C
4. Sterilised skim milk (commercial; non-labelled)
5. UHT-treated skim milk (Stassano - Campina Belgium, Aalter; Belgium)
6. UHT-treated skim milk (Eifel - Perle Hillesheim B3; Germany)

Ingredients (for 1 kg drink):
0.5 g pectin (JM 150; Herculus - Copenhagen (Denmark)
44 g sugar (Kristalsuiker; CSM)
605 g milk
350,5 g water (process water)
citric acid (Merck) (20% (w/w) solution)
8% sodium hydroxide solution

The drinks were prepared as follows. The pectin is first mixed with 20 gr sugar. The pectin/sugar blend is dispersed in 270 gr water of 80°C and allowed to hydrate for 2 hours. 24 grams sugar is dissolved in the cooled milk (4°C). The pectin solution and milk solution are mixed and cooled to 4°C by a counterflow chiller and 80 g cold water is added. The pH of the total mix is adjusted to 4 with 20% citric acid. Directly afterwards the pH is adjusted to either 6.0, 6,25, 6.5, 6,75 or 7 by addition of 8% sodium hydroxide.

The drinks are then stored at 4°C and after 24 hours the extinction of the drinks is determined at 654 nm. The extinctions are given in table 4.

Table 4

Final pH	Extinction at 654 nm					
	1	2	3	4	5	6
6.00	0.471	0.477	0.506	0.352	0.077	0.370
6.25	0.469	0.476	0.499	0.355	0.074	0.364
6.50	0.465	0.483	0.486	0.352	0.071	0.361
6.75	0.458	0.463	0.482	0.349	0.070	0.361
7.00	0.451	0.460	0.473	0.343	0.072	0.368

These results show that the type of milk has a large effect on the final transparency.

EXAMPLE 5

General recipe for clear milk drink without pectin

The clear dairy drink of the invention can also be made without the addition of pectin. This example shows that even better extinction values are obtained.

Ingredients (for 1 kg drink):

44 g sugar (Kristalsuiker; CSM)
605 g milk
350,5 g water (process water)
citric acid (Merck) (20% (w/w) solution)
8% sodium hydroxide solution

The drinks were prepared as follows. 20 gr sugar is dispersed in 270 gr water of 80°C and allowed to hydrate for 2 hours. 24 gr sugar is dissolved in the cooled milk (4°C). The sugar solution and milk solution are mixed and cooled to 4°C by a counterflow chiller and 80 g cold water is added. The pH of the total mix is adjusted to 4 with 20% citric acid. Directly afterwards the pH is adjusted to either 6.0, 6,25, 6.5, 6,75, 7 or 7.25 by addition of 8% sodium hydroxide.

The drinks are then stored at 4°C and after 24 hours the extinction of the drinks is determined at 654 nm. The extinctions are given in the following table 5.

Table 5

Sample	pH	Extinction (654 nm)	
		not heated	heated (2 min. 142°C)
1	6.0	0.074	sediment
2	6.25	0.063	0.785
3	6.5	0.065	0.142
4	6.75	0.066	0.096
5	7.0	0.088	0.156
6	7.25	0.119	sediment

EXAMPLE 6

Effect of acidification pH and final drink pH on transparency of a clear dairy drink

This example shows the effect of the acidification pH and final drink pH on the transparency of the clear dairy drink

Ingredients (for 1 kg drink):
606 g UHT-treated skimmed milk (Stassano, Campina Belgium, Aalter-Belgium)
370 g water (process water)
24 g sugar (Kristalsuiker; CSM)
Citric acid (Merck) (20% (w/w solutions))
8% sodium hydroxide solution

The milk, water and sugar are mixed and the pH is brought to either pH 4.0 or 3.5 by addition of citric acid. After reaching the final pH the pH of the solution is brought to a final drink pH from 5-8 with steps of 0.25 using sodium hydroxide solution. After 48 hours of storage at 4°C, the extinction of the drinks is measured at 654 nm (Table 6).

Table 6

pH drink	Extinction drink Acidification pH=4	Extinction drink Acidification pH=3,5
5	sediment	sediment
5.25	3.601	3.19
5.5	0.1617	0.1213
5.75	0.1103	0.1033
6	0.1002	0.0998
6.25	0.1035	0.0974
6.5	0.0984	0.096
6.75	0.0972	0.0956
7	0.0957	0.094.
7.25	0.0945	0.0932
7.5	0.0931	0.0928

7.75	0.0931	0.092
8	0.0906	0.0918

The data in table 6 show that good transparency can be obtained at pH-values of 5.5 and higher.

EXAMPLE 7

Effect of different acidifiers on the final transparency of a clear dairy drink

This example shows the effect of various acidifiers on the final transparency of clear dairy drinks. Previous experiments showed that good transparency was obtained when using (organic) acids belonging to the group of carboxylic acids such a citric acid and malic acid.

The acids tested are given in the table below. They are dissolved at 20% (w/w) in water or in case of less soluble acids, at their maximum solubility.

Ingredients (for 1 kg drink):
606 g UHT-treated skimmed milk (Stassano, Campina Belgium, Aalter-Belgium)
370 g water (process water)
24 g sugar (Kristalsuiker; CSM)
8% sodium hydroxide solution

The milk, water and sugar are mixed and the pH is brought to pH 4.0 by addition of a 20% acid solution. After reaching the final pH the pH of the solution is brought to a final drink pH of 6.75 using a sodium hydroxide solution. Part of the drinks were heated for 10 minutes at 80°C. After 48 hours of storage at 4°C, the extinction of the heated and unheated drinks is measured at 654 nm (Table 7).

Table 7

structural formula	trivial name	extinction
CH_3-COOH	acetic acid	1.2
COOH-COOH	oxalic acid	3.0
CH_3-CHOH-COOH	lactic acid	0.9
COOH-CH_2-COOH	malonic acid	0.2
COOH-CH_2-CH_2-COOH	succinic acid	0.3
COOH-$(CH_2)_4$-COOH	adipic acid	0.9
COOH-CHOH-CH_2-COOH	malic acid	0.1
COOH-$(CH_2)_3$-COOH	glutaric acid	0.6
COOH-CH_2(C(OH)COOH)-CH_2-COOH	citric acid	0.1
	hydrochloric acid	2.4
	boric acid	2.8
	phosphoric acid	2.2

The extinction values show that best results are obtained with citric acid, malonic acid, succinic acid, and glutaric acid. These are all dicarboxylic acids with 3 to carbon atoms.

EXAMPLE 8

Standard recipe for clear dairy drink using rehomogenisation

Ingredients (for 1 kg drink):
4 g pectin (JM 150; Hercules - Copenhagen (Denmark))
44 g sugar (Kristalsuiker; CSM)
605 g milk (UHT-skim milk; Stabilac)
80 g fruit concentrate (Red-fruit concentrate; Dohler Euro Citrus; Belgium)
citric acid (Merck) (20% (w/w) solution)
8% sodium hydroxide solution
267 g water (process water)

The pectin is first mixed with 20 g sugar

The pectin/sugar blend is dispersed in 267 g water of 80°C and allowed to hydrate for 2 hours. 24 g sugar is dissolved in cooled UHT-milk (4°C). The pectin solution and milk solution are mixed and cooled to 4°C using a counterflow chiller. The fruit concentrate is then added to the cooled mix. The pH of the total mix is adjusted to 4 with 20% (w/w) citric acid.

The acidified mix is subjected to streaming pasteurisation at 85°C for 10 sec and immediately cooled to 55°C using a counterflow chiller. Subsequently the mix is homogenised at 250 bar at 55°C using a Ranny homogeniser (APV) and cooled to 7°C. The pH is increased to 6.75 by addition of 8% sodium hydroxide and the neutral drink is homogenised at 250 bar at room temperature.

EXAMPLE 9

Standard recipe for clear dairy nutritional drink

By adding for example a glutamine peptide preparation (such as WGE80GPA, DMV International, Veghel, NL) to the recipe of Example 3, a nutritional drink can be obtained.

EXAMPLE 10

Extinction of clear dairy drinks of the invention at various wavelengths

In order to establish whether the extinction of the drinks of the invention is dependent on the wavelength used for excitation, three drinks of pH 6.5, 6.75 and 7.0 were measured at various wavelengths.

The results are summarised in Table 8.

Table 8

wavelength (nm)	pH=6.5	pH=6.75	pH=7.0
700	0.2138	0.1864	0.3027
705	0.2099	0.1834	0.2977
710	0.2061	0.1802	0.2928

715	0.2024	0.1771	0.288
720	0.1988	0.1738	0.2834
725	0.1951	0.1708	0.2787
730	0.1915	0.1679	0.2743
735	0.1878	0.1648	0.2697
740	0.1845	0.162	0.2655
745	0.1816	0.1594	0.262
750	0.1787	0.1565	0.2586
755	0.1755	0.1535	0.2551
760	0.1727	0.1509	0.2519
765	0.1701	0.1486	0.2486
770	0.1676	0.1465	0.2454
775	0.1651	0.1445	0.2423
780	0.1624	0.1423	0.239
785	0.1599	0.1403	0.2358
790	0.1577	0.1382	0.2325
795	0.1554	0.1362	0.229
800	0.1532	0.134	0.2262

EXAMPLE 11

Preparation of a clear dairy drink using LM type pectin

Instead of HM pectin used so far, the effect of LM pectin was determined.

Two drinks were prepared, having 0.5 and 1 gram LM pectin per litre drink, respectively.

The pectin (LM pectin, type GENU LM 106 AS-YA; Hercules, Copenhagen (Denmark) and 20 g sugar are mixed in dry form. The mixture obtained is dispersed in 267 g water at 80°C in a vortex and hydrated at the same temperature for 2 hours.

605 g skimmed UHT milk is cooled to 4°C and 24 g sugar is added. The milk/sugar solution and the pectin/sugar solution are mixed leading to a temperature of 20-25°C. The solution obtained is quickly cooled to 4°C in ice water. An additional amount of 80 grams of water is added. Then, 20 % (w/w) citric acid was added until a pH of 4 was reached (the temperature is still 4°C). Subsequently the pH was raised again to 6.75 using 8 % NaOH.

In table 9 below, the extinction of the drinks obtained is listed.

Table 9

LM pectin concentration in the drink (w/w %)	Appearance at pH 6.75	Extinction
0.05	Clear	0.099
0.1	Clear	0.098

From these results it can be concluded that LM pectin is also a suitable pectin type for preparing clear dairy drinks according to the invention.

Also it can concluded that a homogenisation step can be omitted in the process.

EXAMPLE 12

Preparation of a clear milk drink powder

This example shows that a clear milk drink powder can be made which yield a clear milk drink after reconstitution of the clear milk drink powder in water.

Ingredients (for 1 kg drink):
24 g sugar (Kristalsuiker; CSM)
605 g milk (UHT Stassano; Campina Belgium, Aalter, Belgium)
371 g water (process water)
citric acid (Merck) (20% (w/w) solution)
8% sodium hydroxide solution

The milk, water and sugar are mixed and the pH is brought to pH 4.0 by addition of citric acid solution. After reaching a pH of 4.0 the pH of the solution is brought to a final drink pH of 6.75 using sodium hydroxide solution. This solution was stored for 24 hours at 7°C resulting in a clear milk drink.

The clear milk drink was freeze dried with a Christ-LOC beta 1-16 freeze drier (Osterode, Germany) at a

temperature of -20°C and a pressure of 1.2 mbar during 24 hrs.

The freeze dried powder was reconstituted in demineralised water at a concentration of 7,4% (w/w). This is equivalent with the amount of solids in the clear milk drink in liquid form. Table 10 shows the extinction values before and after freeze drying and reconstitution.

Table 10

Sample	Extinction
Clear milk drink	0.123
Reconstituted drink after 1 hour	0.121
Reconstituted drink after 2 hours	0.111
Reconstituted drink after 72 hours	0.097

The extinction values shows that the clear milk drink can be converted into a powder that, after reconstitution in water, leads to a clear milk drink with good transparency.

CLAIMS

1. Clear dairy drink, comprising a milk product as the main ingredient and having an extinction measured in a quartz cell having an optical path length of 1 cm in the range of 400 to 800 nm, in particular at 654 nm of less than 1.

2. Clear dairy drink as claimed in claim 1, having an extinction in the range of 400 to 800 nm, in particular at 654 nm of less than 0.8.

3. Clear dairy drink as claimed in claim 2, having an extinction in the range of 400 to 800 nm, in particular at 654 nm of less than 0.6.

4. Clear dairy drink as claimed in claim 3, having an extinction in the range of 400 to 800 nm, in particular at 654 nm of less than 0.4.

5. Clear dairy drink as claimed in claim 4, having an extinction in the range of 400 to 800 nm, in particular at 654 nm of less than 0.2.

6. Method for producing a clear dairy drink as claimed in claims 1-5 comprising the steps of:

a) providing a milk product of acid pH;

b) optionally subjecting the product to a temperature treatment and/or homogenisation, and

c) adjusting the pH of the product to about neutral.

7. Method as claimed in claim 6, wherein the milk product is further mixed with a negatively charged polysaccharide to obtain a mixture of acid pH.

8. Method as claimed in claim 7, wherein the provision of the mixture of acid pH is achieved by mixing pectin and milk and adjusting the pH of the mixture to about 3.8 to 4.2, preferably to about 4.

9. Method as claimed in claim 7, wherein the provision of the mixture of acid pH is achieved by mixing pectin and butter milk or yoghurt.

10. Method as claimed in claims 6-9, wherein the milk product is an UHT-treated milk product, in particular UHT-treated milk.

11. Method as claimed in claims 6-10, wherein the

product further comprises one or more of the ingredients selected from the group consisting of sugars, fruit juice, fruit mix, food-grade acids, stabilisers, flavours, colorants, non-caloric sweeteners, maltodextrins, non-digestible fibers, nutritional ingredients.

12. Method as claimed in claims 7-11, wherein the negatively charged polysaccharide is selected from the group consisting of pectin, alginate, carboxy methyl cellulose and polyglycol alginate, and is preferably pectin.

13. Method as claimed in claims 7-12, wherein the temperature treatment is a pasteurisation treatment.

14. Method as claimed in claim 13, wherein the pasteurisation treatment is a treatment of 10-20 sec., preferably 15 sec. at 85-95°C, preferably 90°C.

15. Method as claimed in claim 6 or 7, wherein the homogenisation is performed at 150-250 bar, preferably 250 bar.

16. Method as claimed in claim 15, wherein the homogenisation is performed more than once.

17. Method as claimed in claims 6-16, wherein the about neutral pH is a pH between about 6 and 7.5, preferably about 6.5 and 7, more preferably about 6.75.

18. Method as claimed in claims 6-17 further comprising as a step d) one ore more homogenisation steps.

19. Method as claimed in claim 17, wherein the homogenisation is performed at 150-250 bar, preferably 250 bar.

20. Method as claimed in claims 6-19, wherein the drink is cooled prior to step c).

21. Method as claimed in claims 6-19, wherein the drink is cooled after step c).

22. Method as claimed in claims 18 and 19, wherein the drink is cooled prior to step d).

23. Method as claimed in claims 18 and 19, wherein the drink is cooled after step d).

24. Method as claimed in claims 6-23, further comprising the step of drying the drink to obtain a clear dairy drink powder.

25. Method as claimed in claim 24, wherein the clear dairy drink is dried by means of freeze drying, spray drying,

reduced pressure drying or microwave assisted drying.

26. Clear dairy drink obtainable by a method as claimed in any one of the claims 6-25.

27. Clear dairy drink as claimed in claim 26, further comprising nutritional components, such as amino acid preparations, in particular a glutamine peptide preparation.

28. Clear dairy drink as claimed in claims 26 or 27, further comprising lactic acid bacteria and/or probiotic bacteria.

29. Clear dairy drink powder obtainable by drying a clear dairy drink as claimed in claims 26-28.

30. Clear dairy drink powder as claimed in claim 29, wherein the clear dairy drink is dried by means of freeze drying, spray drying, reduced pressure drying or microwave assisted drying.

INTERNATIONAL SEARCH REPORT

Inter. nal Application No
PCT/EP 02/07287

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A23C9/154 A23C9/156 A23C9/137 A23L2/38 A23L2/70

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A23C A23L A23J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	DATABASE WPI Week 197108 Derwent Publications Ltd., London, GB; AN 1971-14816s XP002186421 & JP 46 006815 B (MORITO IKEDA) abstract	1
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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
14 November 2002	25/11/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Lepretre, F

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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